PART : 5

# THE YEARS OF CONSTRUCTION & TRANSFORMATION

**DUBAI**
from small Village
to Global City

Qassim Sultan

# THE YEARS OF CONSTRUCTION & TRANSFORMATION

## DUBAI: From Small Village to Global City

By: Qassim Sultan

**PART: 5**

**CHAPTER: 18 – 20**

## INDEX

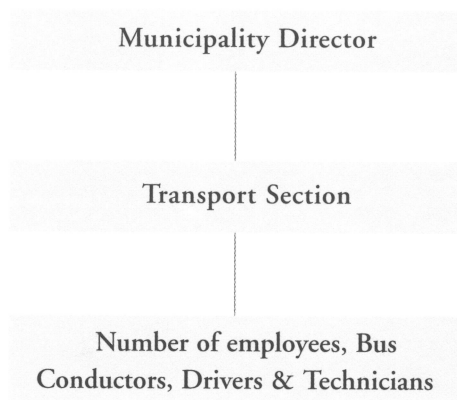
# Establishment and Development of the Public Transport Department

The Public Transport sector is a vital component of transport in any city, permitting movement at low cost and alleviating the traffic congestion caused by the use of private vehicles.Dubai's Public Transport system began in the early 1960s, with the introduction of the first bus service.

During the 1970s, the service was expanded, with a fleet of eleven buses, serving ten routes and operating from two main termini, the Al-Sabkha Station in Deira and the Al-Ghabiba Station in Bur Dubai. The routes covered Al Qusais, Al Rashidiya, Deira to Dhbai, Al-Satwa, Al-Safa, Jumeirah, Al-Jafiliya and Mushrif.

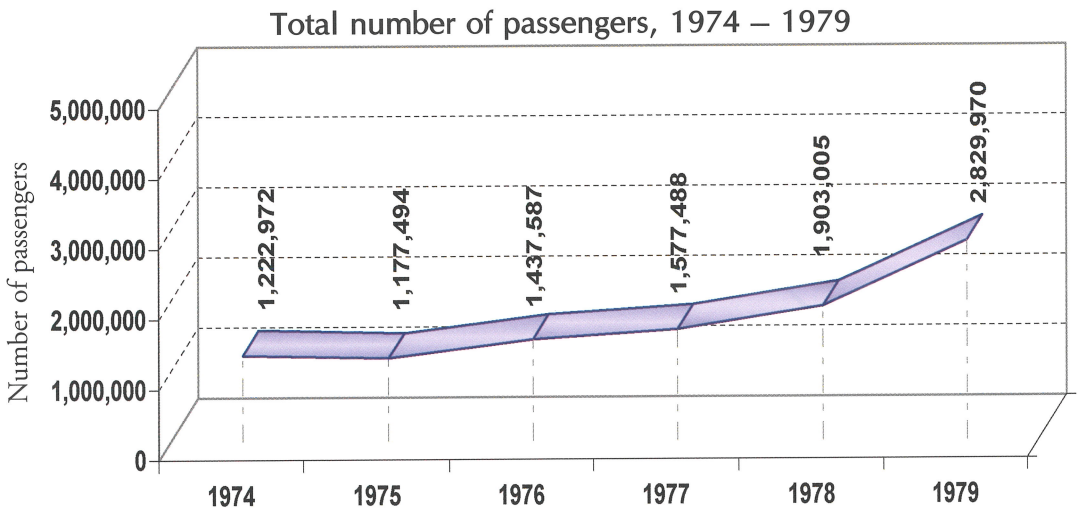
The service was administered and organised by a Section directly affiliated to the office of the Municipality's Director, as shown in Chart No. 1.

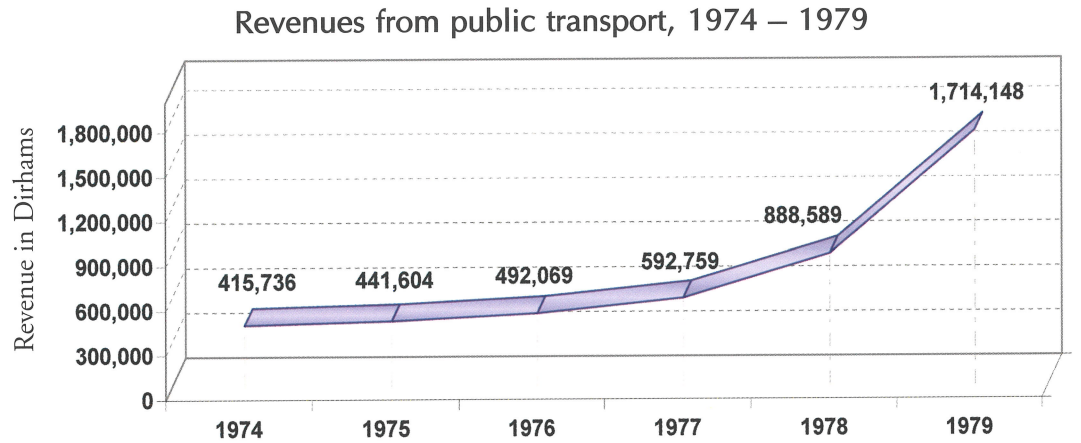
## Chart No. 1. Organisation Chart for the Transport Section in the 1970s




## Revenue and public transport passengers, 1974 – 1979

| Year | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|
| Total number of passengers | 1,222,972 | 1,177,494 | 1,437,587 | 1,577,488 | 1,903,005 | 2,829,970 |
| Total Revenue in Dirhams | 415,736 | 441,604 | 492,069 | 592,759 | 888,589 | 1,714,148 |

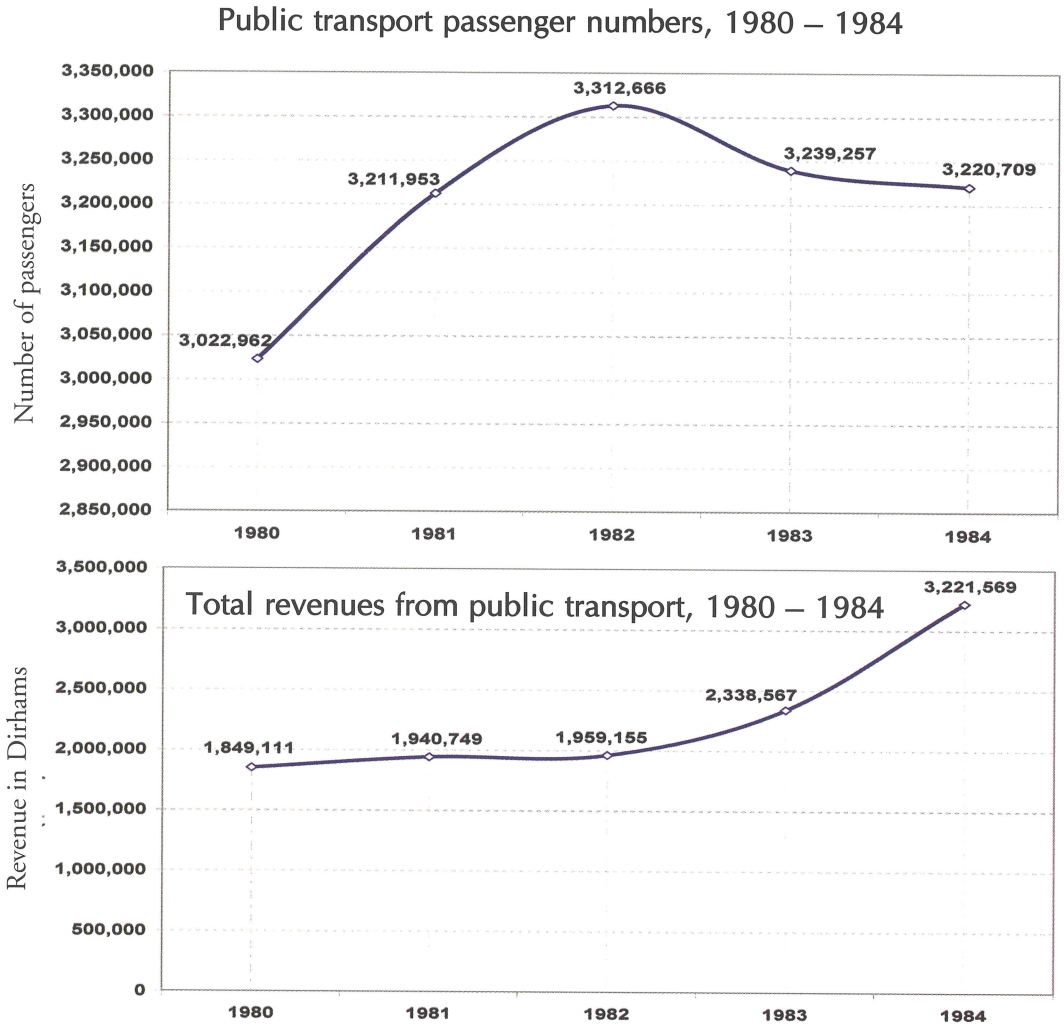



At the beginning of the 1980s, the public transport service was expanded to cover new areas. Planning for this was undertaken by recruiting specialist consultants to lay down the requirements for operating a transport fleet to cover as much as possible of Dubai. This focussed on three main aspects – the need to provide services to the public, Particularly to those of low income, to reduce traffic congestion and to reduce pollution, especially in the centre of the city

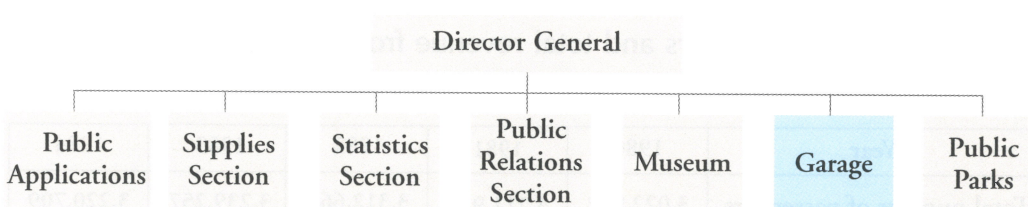
## Number of passengers and total revenue from public transport, 1980 – 1984

| Year | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Total number of passengers | 3,022,962 | 3,211,953 | 3,312,666 | 3,239,257 | 3,220,709 |
| Total revenue in Dirhams | 1,849,111 | 1,940,749 | 1,959,155 | 2,338,567 | 3,221,569 |




In the mid-1980s, the structure relating to the running of public transport within the Municipality was amended, with the responsibility for public transport being transferred to the Garage Section, which came under the Municipality Deputy Director, as shown in Chart No. 2.

## Chart No. 2. General Organisation Chart for Dubai Municipality in 1986

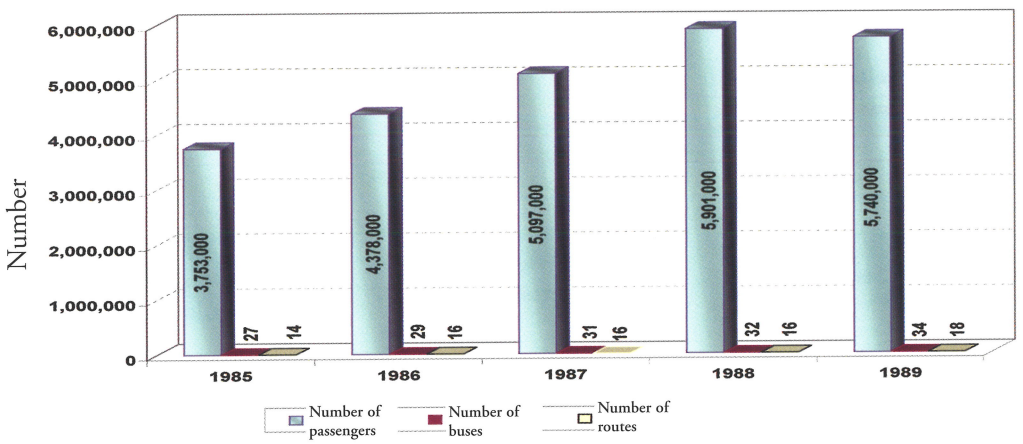



In 1985, consultants were appointed to undertake a detailed study on the planning, construction and operation of a public transport network.

## Public transport passengers, buses and routes, 1985 – 1989

| Item | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|
| Number of passengers | 3,753,000 | 4,378,000 | 5,097,000 | 5,901,000 | 5,740,000 |
| Number of buses | 27 | 29 | 31 | 32 | 34 |
| Number of routes | 14 | 16 | 16 | 16 | 18 |

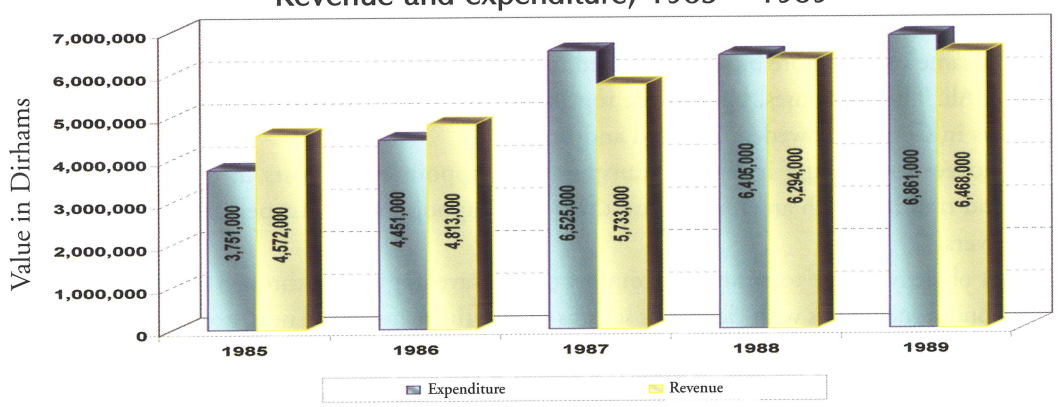
## Public transport passengers, buses and routes, 1985 – 1989




## Revenue and expenditure, 1985 – 1989, in dirhams

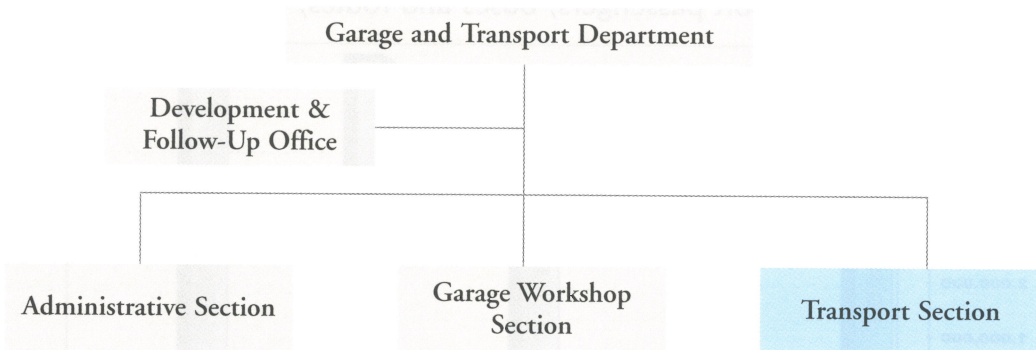
| Item | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|
| Revenue | 3,751,000 | 4,451,000 | 6,525,000 | 6,405,000 | 6,861,000 |
| Expenditure | 4,572,000 | 4,813,000 | 5,733,000 | 6,294,000 | 5,468,000 |

## Revenue and expenditure, 1985 – 1989



During the 1990s, the public transport network was rapidly expanded, to meet growing demand. In preparation for this, Administrative Order No. 31 was issued in 1990, changing the Garage Section into the Garage and Transport Department, while a dedicated Transport Section was created, as shown in Chart No. 3.

## Chart No. 3. Organisation Chart for the Garage and Transport Department in 1990




In 1995, Administrative Decree No. 632 was issued to amend the organisation chart and job description for the Garage and Transport Department, affiliating the Department to the Administrative Affairs and Public Services Sector. Under the terms of this decree, the Transport Section was divided into:

1– The Planning and Marketing Services Unit

2– The Operations Unit

3– The External Transport Unit

4– The Accounts and Public Services Unit

5– The Abra Service Unit.

In the same year,16 more buses were added to the fleet and a new route, No,. 90, was opened to Jebel Ali. The new buses, built to the top international specifications, were purchased from suppliers in Germany, Sweden, Holland and Britain.

Employees specialising in public transport were appointed to posts in planning, operations and training, with an emphasis on the need to appoint specialist personnel to train the bus drivers.

Other objectives were to ensure the comfort of the travelling public through the introduction of air-conditioned buses with electronic screens to give the name of the next stop, as well as ticketing machines that printed out the names and numbers of the routes.

## Transport Network

In order to ensure that proper planning was carried out, the Public Transport Section worked closely with both the Planning and the Roads Departments in investigating the requirements for public transport. Among various studies undertaken were the R400 study in 1992 and the R700 study in 1997, which determined the need for transport and identified the routes for which there was most demand.

## Stations

The Municipality built a number of main bus terminals in Dubai, equipping these with basic information such as timetables and route maps. A number of other bus stations were also built, with the result that a total of eight were in operation, the Gold Market Bus terminal and others at Al-Ghabiba, Al-Sabkha, Al-Qusais, Al-Satwa, Hor Al-Anz, Al-Rashidiya and Jebel Ali.

The Section also worked with the Roads Department on the building of bus shelters at the main stops, with the appropriate signs showing the route numbers and bus timetables.

## Workshop

Maintaining the effective operation of the bus fleet and dealing with occasional breakdowns meant, of course, that a properly-equipped workshop was established, meeting international standards and the appropriate health and safety requirements.

This workshop was given the responsibility for carrying out repairs and routine corrective and preventative maintenance and for keeping stocks of spare parts, as well as that of purchasing new vehicles and scrapping of old ones.

Properly-trained technical staff were recruited to staff the workshop, these being sent overseas, as appropriate, to gain experience.

## Marketing

The Section markets its services to the public through educational programmes in both Arabic and English for television and through printing brochures and booklets, maps showing routes and printed timetables for distribution to the public.

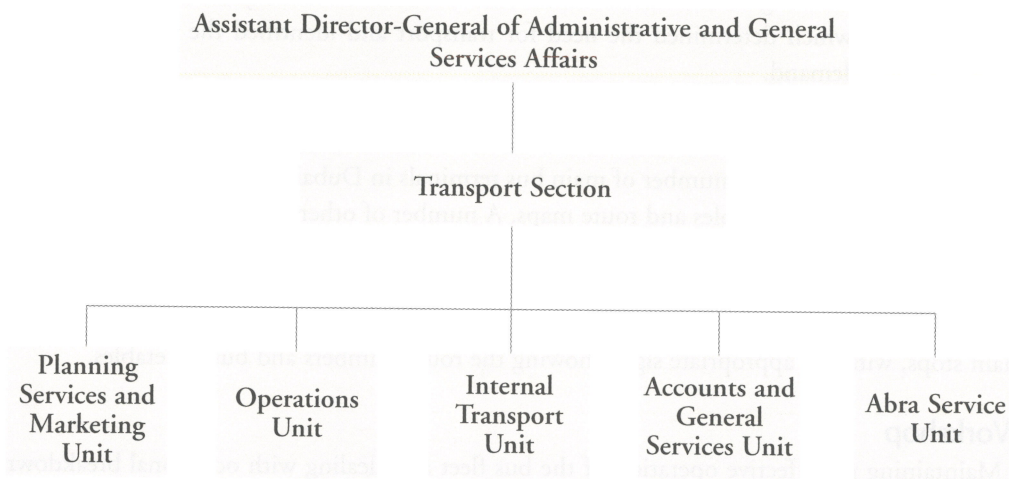
In order to diversify the Section's sources of income, marketing duties also include the sale of space on buses and bus shelters for advertising.

## Research and studies

Regular studies are carried out, usually every three to five years, to assess public transport. These are undertaken by the Planning and Road Departments and the Census Centre, while the Transport Section itself carried out studies to determine the needs for each area of the city. Questionnaires are also distributed to the travelling public to obtain their views on the quality of the services provided.

In 1998, Organisational Directive No. 9 was issued, transferring the Transport Section from the Garage and Transport Department to become an independent administrative unit, retaining the same name, under the supervision of the Assistant Director-General for Administrative and General Services Affairs as shown in Chart No. 4.

## Chart No. 4. Organisation Chart for the Administrative and General Services Department in 1998




In 1999, the process of issuing licences for abras was instituted, while insurance cover was also provided. Courses in fire-fighting and first aid were provided to abra operators.

In 2000, Municipal Ordinance No. 8 was issued to organise the public transport network in the Emirate, with Administrative Directive No. 300 being issued to lay down the regulations for implementation of the terms of the Ordinance. This included:

1– This Specifying public transport routes, lanes, bus terminal and bus stops and all regulations

2– Technical specifications necessary to ensure safe operation of the network

3– Providing for the issuing of tickets of a specific value for each route

4– Allocating special seating for women.

5– Drivers, inspectors and supervisors were also given the status of law enforcement personnel insofar as this was related to their duties.

## Achievements of the section during 2000

Section took delivery of 30 new buses, all of which went into operation, and started six new routes., while computers were installed in the main terminals.

In the same year, the Internal Transport Unit was moved from the Public Transport Section to the Personnel Department, to allow the Section to concentrate on operating public transport. At this time, the Section had 587 employees, including 15 UAE nationals.

## Achievements of the section during 2001

17 more new buses went into operation and signs were erected in each of the bus stations providing information on legal regulations, how to board and to alight from buses and similar topics. Electronic programmes to help operation of the network were introduced into the control rooms while a maintenance programme for abras was also started.

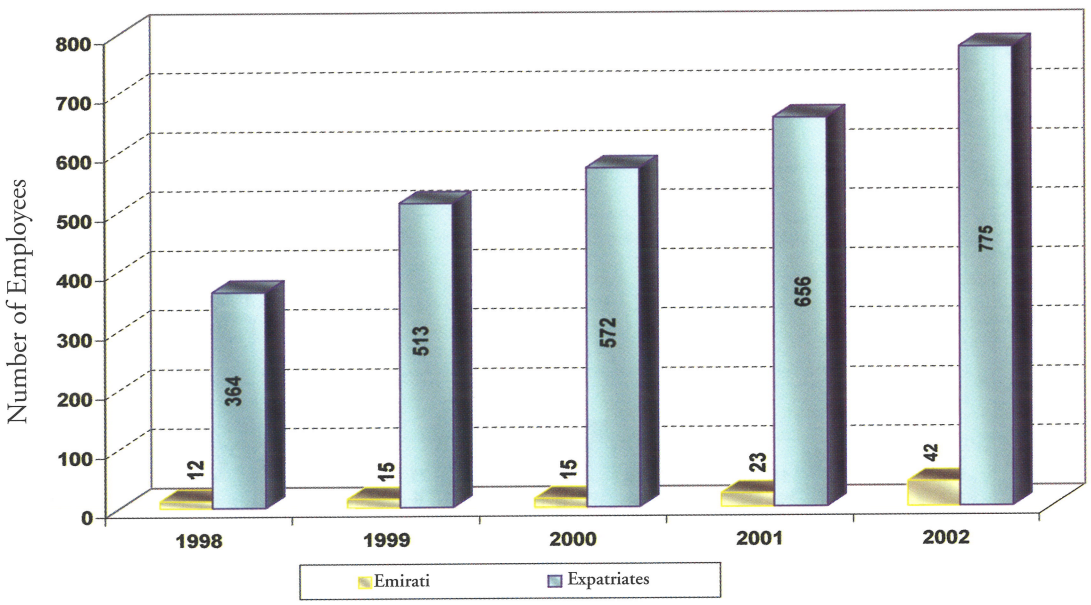
Other developments during 2001 relating to the operation of abras included the introduction of a system for the issuing of licences electronically, getting these licences approved by the Ministry of Labour and the Naturalisation and Residency Department, approving plans for new locations for abra stations and setting a fixed rate for both rowing and motorised abras for tourist voyages in the Creek.

The Section also took part in the activities of the 2001 Dubai Festival.

### Number of employees in the Transport Section, 1998 – 2002

| Year | Number of Employees | | |
|---|---|---|---|
| | Emiratis | Expatriates | Total |
| 1998 | 12 | 364 | 376 |
| 1999 | 15 | 513 | 528 |
| 2000 | 15 | 572 | 587 |
| 2001 | 23 | 656 | 679 |
| 2002 | 42 | 775 | 817 |

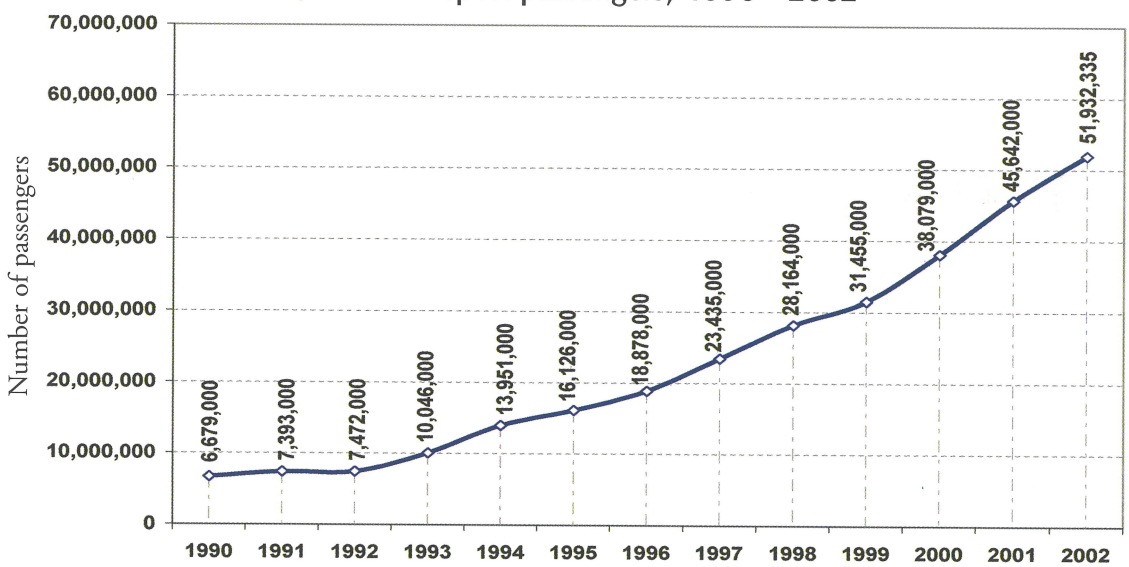
### Employees in the Transport Section, 1998 – 2002



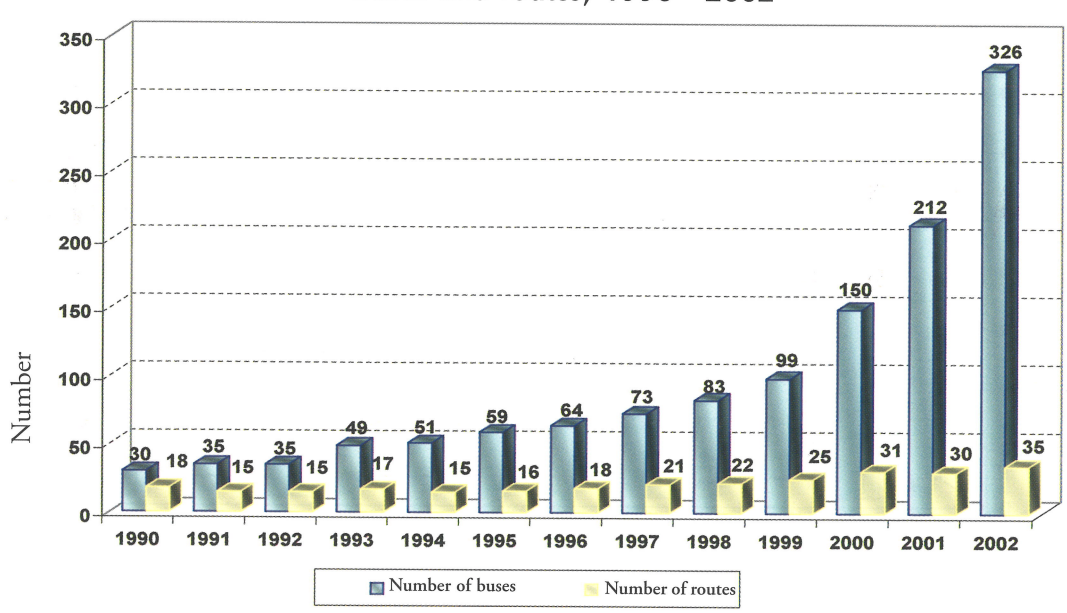
## Number of public transport passengers, buses and routes, 1990 – 2002

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Passengers | 6,679,000 | 7,393,000 | 7,472,000 | 10,046,000 | 13,951,000 | 16,126,000 | 18,878,000 | 23,435,000 | 28,164,000 | 31,455,000 | 38,079,000 | 45,642,000 | 51,932,335 |
| Number of Buses | 30 | 35 | 35 | 49 | 51 | 59 | 64 | 73 | 83 | 99 | 150 | 212 | 326 |
| No. of Routes | 18 | 15 | 15 | 17 | 15 | 16 | 18 | 21 | 22 | 25 | 31 | 30 | 35 |

## Public transport passengers, 1990 - 2002




## Buses and routes, 1990 - 2002



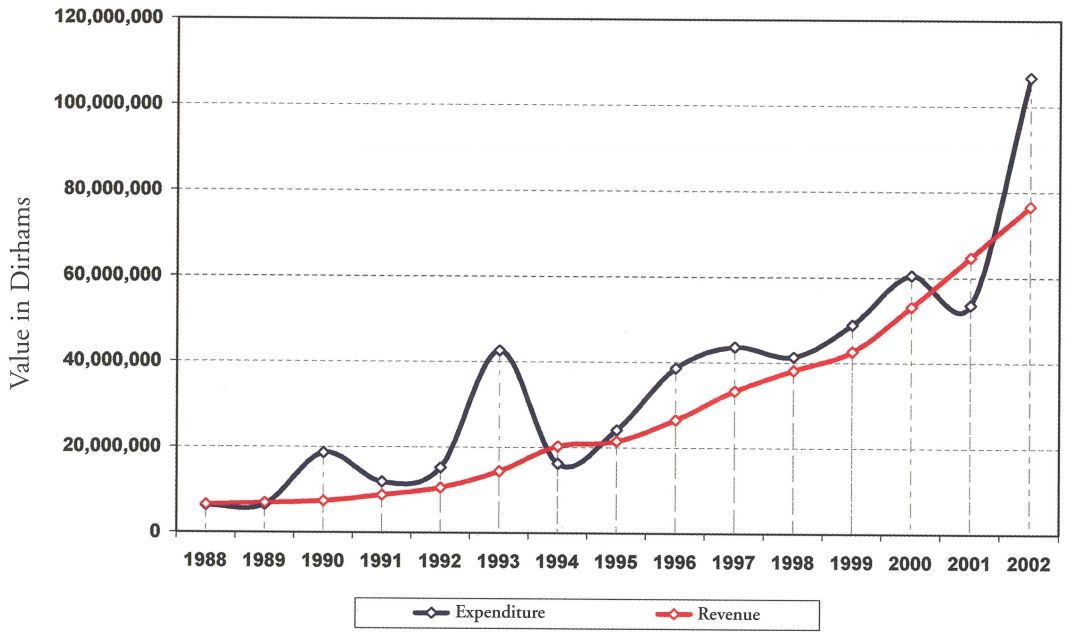

Public Transport Buses

## Expenditure and Revenue of the Transport Section, 1988 – 2002, in dirhams

(Note: the Section became the Public Transport Department in 2001)

| Year | Total Expenditure | Total Revenue |
|---|---|---|
| 1988 | 6,293,611 | 6,405,273 |
| 1989 | 6,467,693 | 6,861,385 |
| 1990 | 18,554,546 | 7,282,524 |
| 1991 | 11,815,286 | 8,730,025 |
| 1992 | 15,170,675 | 10,451,453 |
| 1993 | 42,540,065 | 14,353,081 |
| 1994 | 16,203,538 | 20,213,000 |
| 1995 | 24,045,638 | 21,467,277 |
| 1996 | 38,596,010 | 26,425,701 |
| 1997 | 43,563,027 | 33,259,728 |
| 1998 | 41,280,616 | 38,102,038 |
| 1999 | 48,855,402 | 42,557,649 |
| 2000 | 60,416,188 | 53,064,968 |
| 2001 | 53,528,328 | 64,634,135 |
| 2002 | 106,682,974 | 76,590,473 |
| Total | 438,013,597 | 430,398,710 |

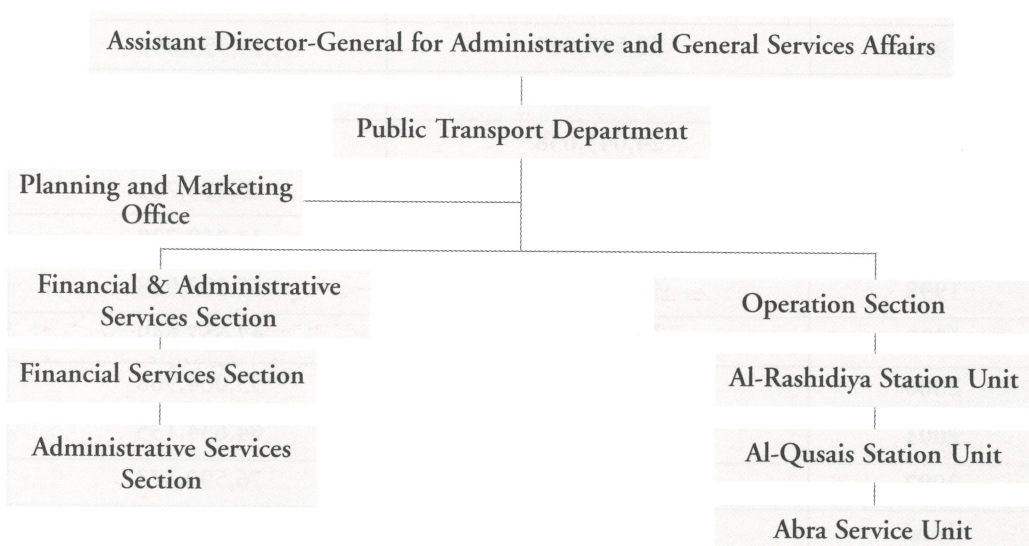
Transport Section revenue and expenditure, 1998 – 2002




## Establishing the Public Transport Department

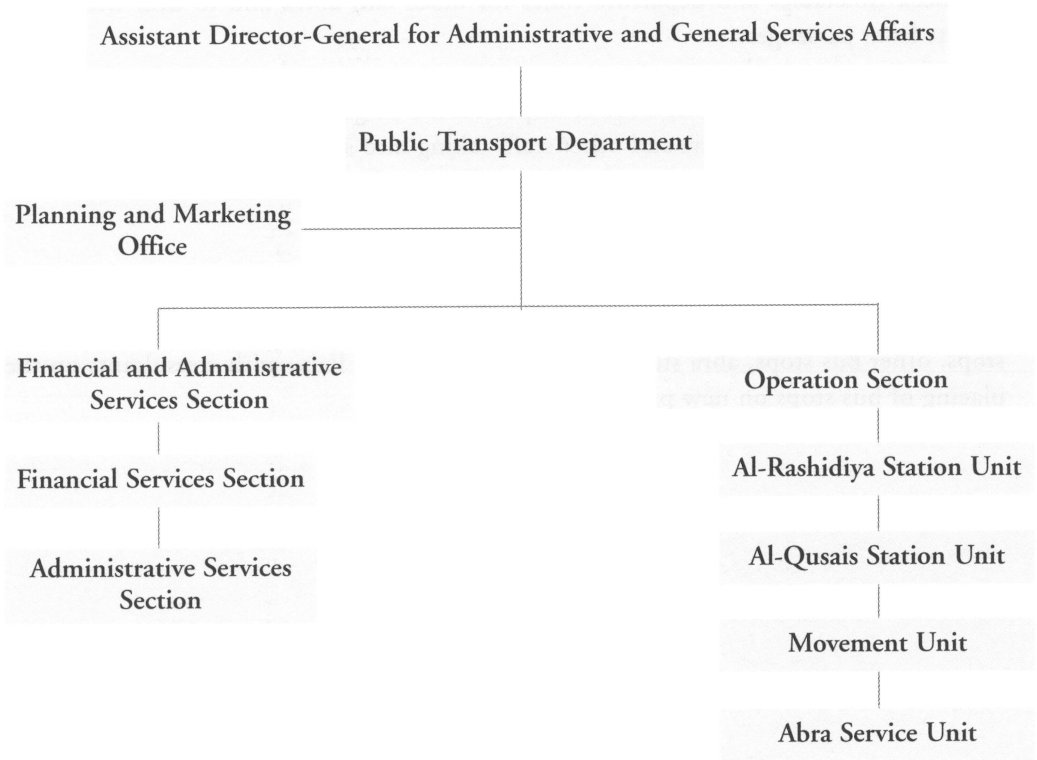
In 2001, Organisational Directive No. 12 was issued to raise the Transport Section to the status of a Department, named the Public Transport Department. Directive No 168 laid down its organisational structure, as shown in Chart No. 5.

### Chart No. 5. Organisation Chart for the Public Transport Department in 2001



In 2002 the organisation chart for the Department was amended, as shown in Chart No. 6

## Chart No. 6. Organisation Chart for the Public Transport Department in 2002




The main duties and responsibilities of the Public Transport Department and affiliated Sections are as follows:

1– To implement the instructions approved by the Director-General in respect to policies, legislation, directives and Municipality procedures relating to public transport.

2– To prepare and implement plans, budgets and annual departmental work schedules according to the relevant directives.

3– To provide efficient and reliable transport for the public through effective administration of bus services, time tables, maintenance requirements and personnel affairs as well as selling of and accounting for tickets.

4– To monitor demand for bus and abra routes in order to plan for the expansion of those routes and the opening of new routes, to change the numbers of buses or abras to meet demand and to work to increase the use made of the public transport system.

5– To monitor the movement and time-keeping of buses during each shift and to take the necessary measures to limit any interruption of services due to breakdowns, as well as taking prompt action to undertaken repairs to buses, where necessary.

6– To check timetables and departure times for buses and abras and to deal with complaints from passengers.

7– To ensure that an adequate number of inspectors are on public transport routes to monitor the behaviour of drivers and other staff, taking into account the need for accuracy, reliability and correct accounting for ticket sales as well as the need to ensure the comfort and safety of passengers.

8– To co-ordinate with other departments and sections dealing with planning, surveying and road management, as appropriate, when carrying out studies on sheltered bus stops, other bus stops, abra stations and the like, and to liaise with consultants on the placing of bus stops on new parts of the road network.

# The Abra Service (Water Taxi)

## The Abra Service (Water Taxi)

The movement of the Abras, (wooden water-taxis) to and fro across Dubai Creek represents an important part of traditional life in the city, and is seen by residents of and visitors to the City, especially if the location of their work or residence is close to the Creek, the heart of Dubai.

In the past, the abras were the main form of transport across the Creek, and the preservation of this tradition is considered to be an important link with the past. It remains important today, as well, with around 15 million passengers a year still crossing the Creek by abra.

Recognising the important role that abras play in the transport network in Dubai, an Abra Services Division was created within the Municipality's Transport Section in 1995, under the terms of Administrative Directive No. 632 for 1995, and was given responsibility for organising abra services. One early move was the building of new modern landing stages for abras in both Bur Dubai and Bur Deira.

Abras are of two types, those that are rowed and those that are equipped with motors.

### • Rowing Abras

Rowing Abras are probably the earliest forms of transport across the Creek. They formerly operated between Bur Dubai and Deira from a main landing stage in front of Captain's Stores in Bur Dubai and another main landing stage in Al-Ra's, in front of the public library in Deira. There was also another landing stage that was used occasionally at Bandar Talib, also in Deira.

Due to limited space in front of Captain's Stores, the Bur Dubai landing stage was then moved to another location adjacent to the offices of the British Bank of the Middle East (now HSBC). There were also a number of smaller landing stages dispersed along both sides of the Creek.

The first proper study of the abras was carried out in 1993 by the Municipality's Census Centre. This showed that there were then 13 abras in operation, each between 30 and 40 years old. Each abra had the capacity to carry four or five passengers, and the oarsman worked, on average, for twelve hours a day, the fee for the crossing was then two dirhams.

In 1997, the Municipality bought five new rowing abras, and employed five boatmen to operate them at Municipality expense. These abras were based at the:

1– Public library landing stage

2– At Al-Khor Park

The fee remained at two dirhams per person, later reduced to one dirham, with a Dh 30 charge for a one-hour tour.

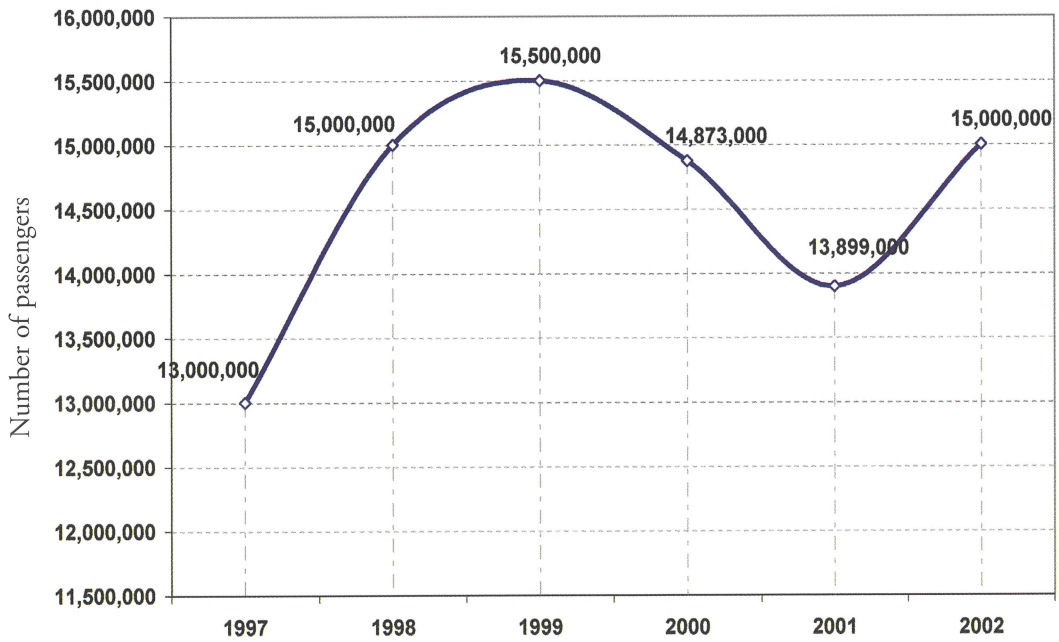
## • Motorised Abras

As Dubai developed and there was an increase in the movement of traffic between Bur Dubai and Bur Deira, motorised abras were introduced. These operated from the Old Market landing stage in Bur Dubai and the Garage Landing Stage in Beni Yas Street in Bur Deira. A maximum of 20 passengers per voyage was set, with a cost of 25 fils per passenger, increased to 50 fils in 1995.

### Number of Abras in operation and the number of passengers, 1997 - 2002

| Year | Number of Registered Abras | Average number of Abras in operation | Number of passengers |
|---|---|---|---|
| 1997 | 140 | 100 | 13,000,000 |
| 1998 | 148 | 100 | 15,000,000 |
| 1999 | 149 | 113 | 15,500,000 |
| 2000 | 149 | 128 | 14,873,000 |
| 2001 | 149 | 135 | 13,899,000 |
| 2002 | 148 | 100 | 15,000,000 |

### Abra passengers, 1997 - 2002



The Abra is one of the main methods of transport between Deira and Bur Dubai

In 1998, Municipal Ordinance No. 6 was issued to regulate the organisation of abra movement on the Creek – the first such ordinance ever issued. It provided the Municipality with the responsibility for supervising the activity, and gave it the power to determine landing stations and the routes to be used across the Creek. It also laid down daily working hours, set the maximum loads and specified that the fee charged should be 50 fils (half a dirham).

In the same year, Administrative Directive No. 299 was issued to lay down the relevant regulations and rules related to Ordinance No. 6. These included specifications of abras and provisions for the testing of them, the issuing of operating permits, specifying the landing stages to be used, working hours, (from 5 am until midnight), and the maximum number of passengers (20), as well as laying down penalties for the breach of any regulation.

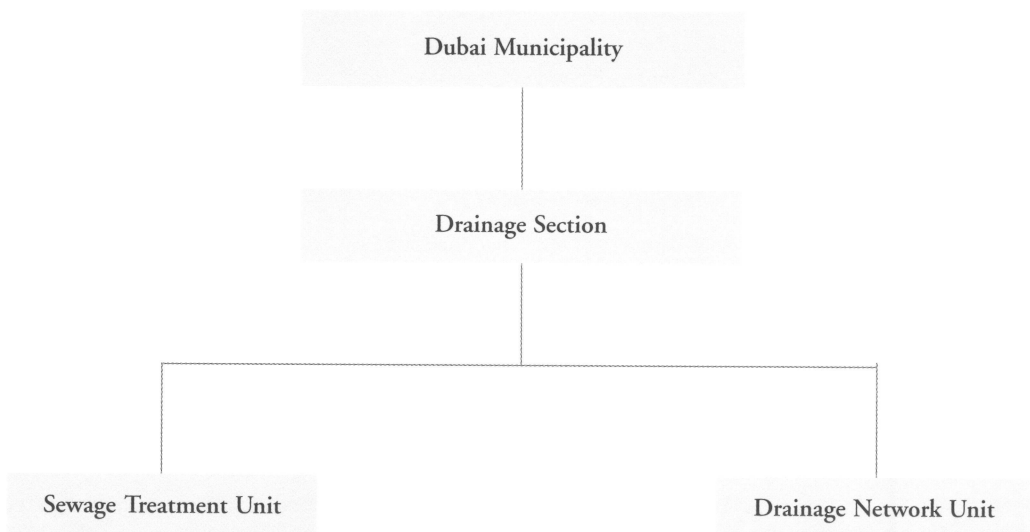
# Drainage and Irrigation Department

Until 1965, there was no drainage and sewerage system in Dubai, residents depending, at best, on septic tanks. In that year, however, on the instructions of H.H. the late Sheikh Rashid bin Saeed Al Maktoum, the first plans were drawn up for a drainage system, designed to serve a population of up to 60,000 people. The construction of the network was carried out under the supervision of the Ruler's Office.

In 1971, the first sewage treatment plant was opened, and some of the old residential and commercial areas were linked to the system. The plant had a daily capacity of 3,500 cubic metres, and was located on the shore of the Creek in Bur Dubai, at a considerable distance from all residential areas.

In 1974, HH Sheikh Rashid issued a decree instructing the Dubai Municipality to draw up plans for the overall development of Dubai, these to include plans for the infrastructure of the expanding city. For this to be done, it was necessary for a technical body to be established that could be placed in charge of planning and implementation of the drainage and sewerage aspects of the work, and the Drainage Section was established, as shown in Chart No. 1.

## Chart No. 1. Organisation Chart for the Drainage Section in 1974



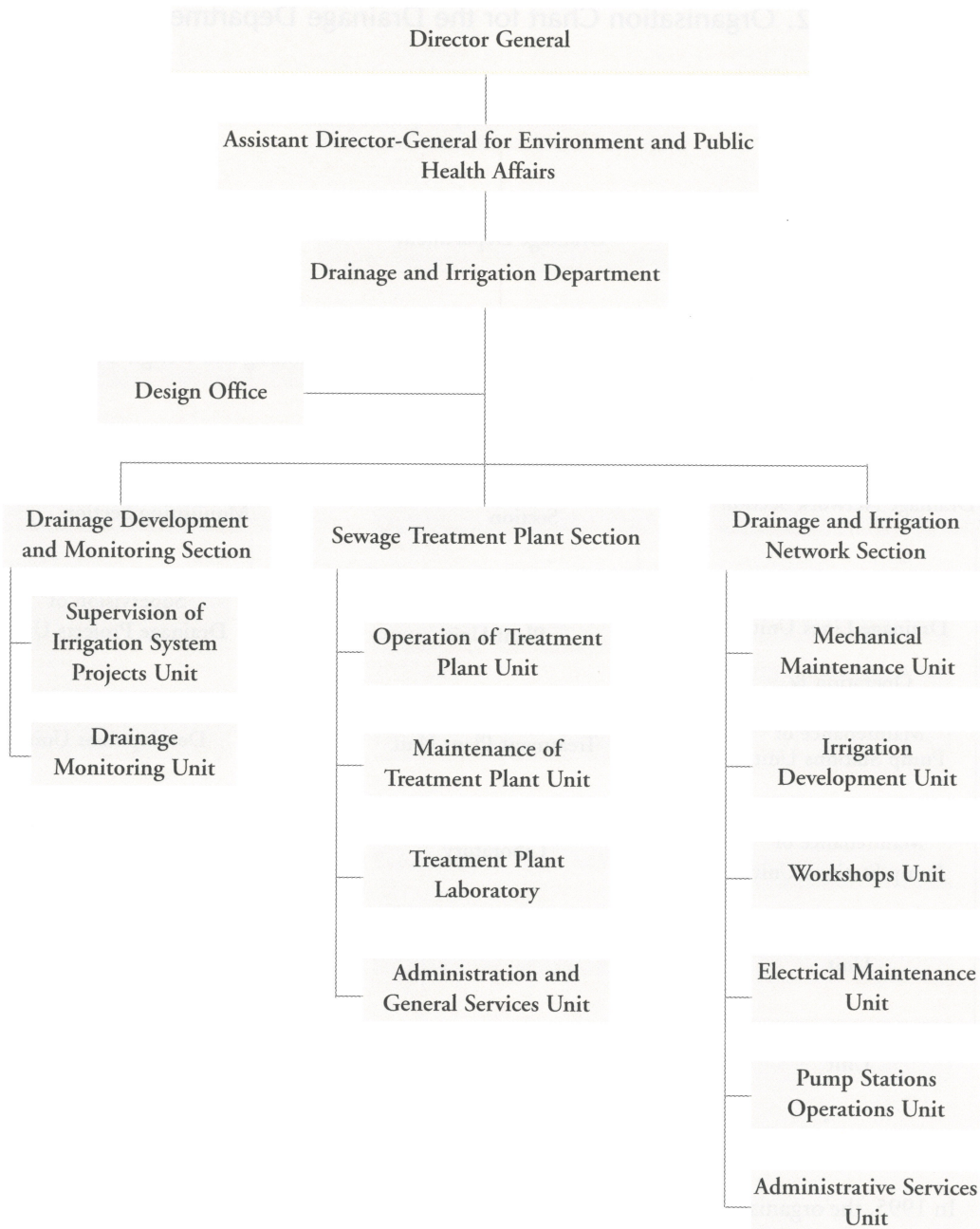

Over the course of the following decade and a half, the rapid expansion of Dubai meant that there was also a very substantial increase not only in the number of size of drainage and sewerage projects built, and then requiring operating and maintenance, but also in the workforce of the Section, which grew by the end of the 1990s to over 600.

In recognition of this, the Section was raised to the level of a Department, as shown in Chart No. 2.

## Chart No. 2. Organisation Chart for the Drainage Department in 1990

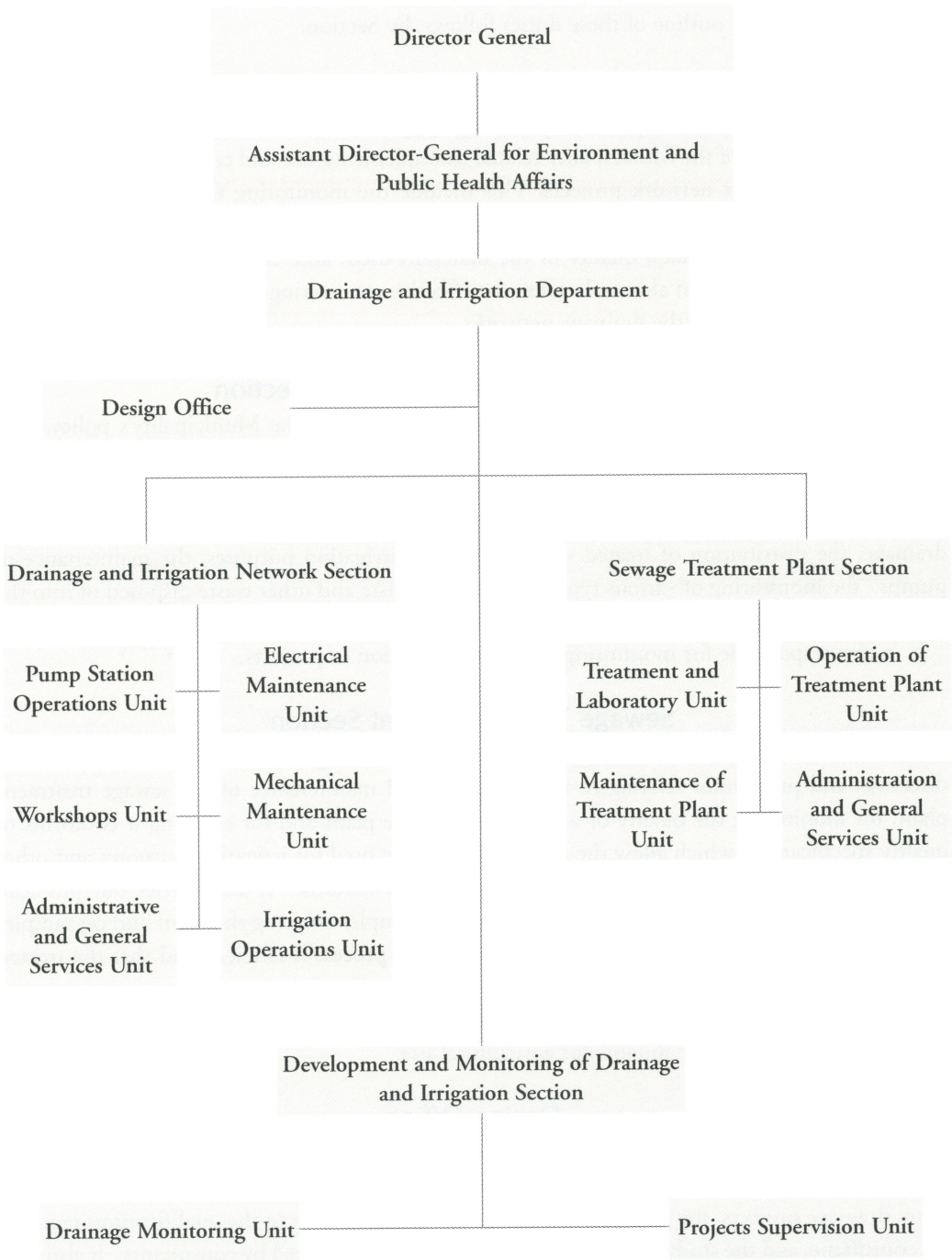

In 1995, the organisation chart was amended and the Department was re-named the Drainage and Irrigation Department, this being placed directly under the Assistant Director General for Environment and Public Health Affairs. At this time, there were three main sections in the Department, as well as a design office, as shown in Chart No. 3.

## Chart No. 3. Organisation Chart for the Drainage and Irrigation Department in 1995




The continued expansion of the responsibilities of the Department led to a further increase in its employees, who numbered 741 by 2002.

## Chart No. 4. Organisation Chart for the Drainage and Irrigation Department in 2001



## The Main Duties of the Drainage and Irrigation Department

As noted above, the original Drainage Section was formed in 1974, with the Drainage and Irrigation Department being established in 1995. The duties and responsibilities of the original Section and then of the much-enlarged Department were continually updated as the growth of Dubai continued. An outline of these duties follows, by Section.

### Drainage and Irrigation Development and Control Section

This section take up the responsibility of proposing and implementing policies, rules, directives and procedures of the Municipality related to implementation and control of drainage, irrigation and rain water network projects. This include the monitoring the implementation of these projects as per the conditions and specifications laid out by the Municipality for them such as the design, execution map, quality of the materials used, and the implementation time. In addition to that the section also undertakes the effective monitoring of different kinds of industrial waste disposed off in the drainage networks.

### Drainage and Irrigation Network Section

This section is responsible for suggesting and implementing the Municipality's policy, laws and procedures relating to the effective operation and maintenance of all drainage, irrigation and rainwater drainage networks, including the supervision of operating and maintenance of all pump stations, the carrying out of preventative and programmed maintenance work, rainwater drainage, the distribution of treated sewage water for irrigation purposes, the maintenance of pumps, the monitoring of various types of industrial waste and other waste disposed of into the drainage network and other tasks.

It is also responsible for monitoring the implementation of projects.

### Sewage Treatment Plant Section

This Section is responsible for suggesting and implementing the Municipality's policy, laws, directives and procedures relating to the operation and maintenance of the sewage treatment plant, for monitoring the quality of water treated in the plant and for ensuring it conforms to quality specifications which allow the treated water to be used for irrigation purposes and other useful requirements, without health or environmental hazards. It also carries out physical, chemical and microbiological tests on drainage water samples entering the plant and on samples of water leaving the plant, to ensure that the treatment process is efficient and that the treated water is not contaminated.

The plant also has a unit for handling the sludge resulting from the treatment process, turning it into organic fertiliser suitable for agricultural use.

### Design Office

This Office is responsible for suggesting and implementing the Municipality's policy, laws, directives and procedures relating to the planning and design of drainage, irrigation and rainwater drainage projects, the preparation of documentation relating to the qualifications required for consultants and the study of designs and cost estimates submitted by consultants. It also puts forward medium and long-term plans for the development of drainage and irrigation.

## Development of drainage and irrigation projects

The years from 1970 to 1976 saw a major expansion to the existing network, with the Al-Riqqa West, the Musala in Bur Dubai, parts of Al-Maktoum Street, Al-Refa'a and Zabeel East being added.

Between 1976 and 1978, the network was expanded to cover Al-Baraha, more of Al-Maktoum Street, Al-Safiya, the Dubai Police headquarters, parts of Al-Qusais, Al-Hadhbiya, the area of the Armed Forces Central Command and the Al-Safa Park villas.

In 2001, another amendment was made to the organisation chart, as shown in Chart No. 4, to take account of the increasing number of projects being handled by the Department. The names and duties of some of the subsidiary organisational units were also amended.

In 1979, work on the expansion of the sewage treatment plant was completed. This involved the construction of aerating tanks to permit the production of treated water suitable for irrigation along roads in Bur Dubai, Al-Safa Park and the cement factory area.

In the same year and in 1980, further additions were made to the drainage network, including Al-Musala, Al-Mateina, Al-Riqqa East, Riqqa Al-Bateen, Al-Muraggabat, the Trade Centre area, Al-Satwa East and Al-Hadhbiya in Bur Dubai.

By the end of 1980, average flow of wastewater to the treatment plant reached 22,000 cubic metres a day, above the design capacity of 21,400 cubic metres. It was, therefore, decided to expand the plant, to bring capacity up to 38,000 cubic metres a day, suitable for a population

Aerial view of the Sewage Treatment Plant in Al-Aweer

## Table No. 1. Employees working in the Drainage and Irrigation Department and its predecessor, the Drainage Section, 1961-2002

| Year | 1961* | 1970* | 1975* | 1980 | 1985 | 1990 | 1995 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|
| Total Number of Expatriate employees | 3 | 4 | 15 | 84 | 147 | 445 | 415 | 547 | 512 |
| Number of Emiratis | - | - | 1 | 1 | 3 | 31 | 46 | 48 | 62 |
| Percentage of Emiratis | 0 | 0 | 6.7% | 1.2% | 2.1% | 7.0% | 11.1% | 8.8% | 12.1% |
| Number of Labourers ** | - | 5 | 2 | 38 | 74 | 202 | 182 | 228 | 229 |
| Total number of employees*** | 3 | 9 | 17 | 122 | 221 | 647 | 597 | 775 | 741 |

* The number of employees between 1961-1975 represents the labourers and tanker drivers working for the Section at the time.

** No Emiratis in this sector

*** Total number of personnel in the Department = Total number of employees + number of labourers.

Sludge Fermentation Tanks

of around 190,000. This work was completed in 1983, permitting the further extension of the network, to the remaining parts of Zabeel, Abu Hail, Port Saeed, Al-Khabaisi, part of Al-Mankhool, Umm Hurair, the Guest Palace complex, Jumeirah Mosque, parts of Al-Wasl Street and Al-Safa Street.

By the end of 1984, around 195,000 people, or about 60 per cent of Dubai's inhabitants, were connected to the network, with the amount of wastewater production being treated having risen to 42,000 cubic metres a day.

In 1989, with the population of Dubai continuing to grow rapidly, the Department carried out an extensive survey of the existing network, which showed that much of it, particularly that part laid down in the 1970s, had been affected by a variety of factors. These included the penetration of tree roots, the accumulation of and solidifying of fat and grease from kitchens, the collapse of some piping, the effect of nearby construction work and the rapid deterioration of the asbestos pipes that had been widely used.

It was apparent, therefore, that a major programme of rehabilitation and renewal was required. This task needed careful planning, since many of the older networks were in important commercial districts, such as Al-Sabkha, Al-Bateen, Al-Ra's, the large Market and Al-Fahidi Street, where work on the system could have an adverse effect on the flow of traffic.

A number of specialist companies were approached, and several were then awarded contracts to carry out maintenance. This work took place between 1991 and 1995 and included the relining of collapsed piping, the expansion or reduction of the diameters of pipes laid, depending of the volume of flow, and, wherever possible, the laying of new pipes to replace those which could not be repaired without the need for new excavations, so as to avoid the blocking of roads.

Through the laying of deep, new, large-diameter main pipes, it was also possible to remove some of the need for pumping stations.

## The rainwater and surface water drainage networks

Prior to the recent development of Dubai, any rainwater used to be drained naturally into the Creek, or was absorbed by the highly-porous soil. The development of the city, however, including not only its buildings but also areas that are now roads and car parks, has not only reduced the amount of the surface area where a natural absorbing of rainwater used to take place but has also obstructed the natural flow of surface water towards the Creek.

This has been compounded by the fact that groundwater levels have also risen, as a result of irrigation and through the seepage of water from septic and treatment tanks.

As a result, rainwater began to collect in low-lying areas.

During the 1970s, special drainage pipes were laid to drain stagnant water from such areas to the Creek, while the Municipality also introduced a special groundwater drainage system in areas with relatively few buildings or other construction. As a result, standing water in low-lying areas was removed, reducing potential health hazards.

This was then followed by the construction of a new rainwater drainage system, operating both on the basis of natural flow and on the use of pumps, to collect the water and to discharge it into the sea, the Creek or into artificial "lakes" that were specially constructed for this purpose.

The following table provides details of these temporary "lakes".

A further six artificial lakes are due to be completed in various areas of the city by 2009, while

most of both Deira and Bur Dubai have now been connected to the rainwater drainage network.

In order to cope with the rising groundwater levels, methods of automatic control were introduced whereby water rising above a prescribed level was drawn off and discharged into the rainwater drainage networks.

This had the effect of improving the ability of the soil to absorb the remaining water, of ensuring that there was less stagnant water in low-lying areas and of improving the irrigation of trees. It also had the effect of generally protecting the basic infrastructure of the city.

In order to operate the rainwater drainage system, several pumping stations were built throughout the city:

- One in Hor Al-Anz, with a capacity of 2,000 litres per second (l/sec) was completed in 1984.
- One in Al-Garhoud with a capacity of 1,800 l/sec in 1985,
- One near the Port with a capacity of 3,200 l/sec in 1991
- One in Al-Satwa with a capacity of 3,200 l/sec, also in 1991.
- In 1995, stations in Al-Shandagha, with a capacity of 800 l/sec
- In Al-Karamah, with a capacity of 3,000 l/sec.

Rainwater drainage networks were also completed in 1990 in the Bur Dubai area, from Sheikh Zayed Road to the sea, and in Al-Garhoud, Al-Rashidiyah, Al-Quoz and Al-Aweer.

Further networks in residential and commercial areas of Deira, running from Al-Ittihad Street to the sea, were completed in 1993.

| Number | Area | Date of Construction | Area, in sq. metres |
|---|---|---|---|
| 1 | Al-Qusais | May 1990 | 82,707 |
| 2 | Al-Safa | August 1992 | 42,000 |
| 3 | Al-Quoz | January 2001 | 27,353 |
| 4 | Nad El Sheba | February 2002 | 20,000 |

| Number | Area | Date of Construction | Area, in sq. metres |
|---|---|---|---|
| 1 | Al-Qusais | July 2003 | 55,000 |
| 2 | Al-Qusais | June 2003 | 173,433 |
| 3 | Nad Al-Sheba | January 2003 | 26,000 |
| 4 | Nad Al-Sheba | January 2003 | 20,000 |
| 5 | Al-Barsha | December 2003 | 57,000 |

Artificial lakes at Nad Al-Sheba

Artificial lakes in Al-Quoz

## Construction of a new modern plant for treatment of Dubai City's wastewater

The expansion of the drainage and sewerage network meant that there was a need to expand sewage treatment facilities. The old plant, at the inner end of Dubai Creek, could no longer cope, and lacked the space to expand, while it was also a source of complaints from local residents. In 1984, therefore, plans were drawn up the for building of a new plant, with a treatment capacity of 130,000 cubic metres a day or 330 gallons per second, and allowing for an expansion to 250,000 cubic metres a day.

A site for the new plant was selected 15 km. outside Dubai on the road to Al-Aweer. This location, on a raised area, was selected because a contour survey showed that it would be possible to construct the plant in such a way that the wastewater would flow naturally through the various stages of treatment, as a result of gravity, so that no pumps would be needed. The plant was designed to use the Activated Sludge System. 14 Emirati engineers were trained to run the project.

The project for the new plant also included five main pumping stations on the drainage and sewerage network, to pump wastewater to the plant.

Overall, the project cost Dh 700 million, of which Dh 400 million was for the plant itself, (Project No. DS/51) and the remaining Dh 300 million for the pumping stations (Project No. S/52).

The new sewage treatment plant and the associated works on the drainage and sewerage network were designed with several objectives in mind. One was that of keeping pace with the population growth in Dubai, to allow for the linking of around 70 per cent of the area of greater Dubai to be linked to the network.

By doing this, it would then be possible to reduce health hazards and threats to the environment caused by the contamination of groundwater or beaches by liquid untreated waste.

Remote Control System

The plant was designed to ensure high quality treatment of the wastewater so that all of it could be safely used in sprinkler and drip-feed systems for agriculture and irrigation.

Thus providing water to help to meet the objective of having eight per cent of the overall area of Dubai planted with parks, gardens, trees and woodlands.

The remaining waste was then treated with heat to permit its use as organic fertiliser, free from germs, parasites or dangerous impurities.

## Implementation of the Plant Project

Work on the computer-controlled plant, which covered an area of 420,000 sq. metres, began in 1985, with the cost of the first phase, as noted above, being Dh 400 million. Operational capacity was 130,000 sq. metres a day, with a maximum average hourly flow of 10,800 cubic metres an hour.

Wastewater first began arriving at the plant on 5th March 1989, and the Municipality took delivery of the plant from the contractors on 8th December 1991, then becoming fully responsible for its operation and maintenance.

## Treatment System

As noted previously, the location of the plant was selected so that wastewater would flow naturally from stage to stage, without the need for pumps.

The three-stage system includes mechanical treatment, biological treatment and then filtration and sterilisation, the end result being treated water suitable for irrigation. A laboratory for carrying out tests is included in the plant, as well as workshops for maintenance.

Offices, accommodation for the workforce, a recreational building, playing fields and a mosque were built as part of the complex while back-up generators were also installed, to provide an alternative source of power in the event of a breakdown in supplies from the Dubai Electricity and Water Authority, DEWA.

With the plant in full operation, it registered an average daily flow in September 1994 of 116,000 cubic metres a day, or 89 per cent of designed capacity.

## Plant Development

On 7th January 1995, in response to the continued projected increase in Dubai's population, the Municipality commissioned an initial study on the expansion of the plant to an overall capacity of 250,000 cubic metres a day, sufficient to meet the needs of around 1.2 million people.

Work on implementing the Phase Two expansion, (Project S/100), began on 31st August 1998 and was completed in March 2001, at a cost of Dh 295 million.

The Municipality has now prepared plans to take account of planned population growth and the consequent increase in demand for drainage, sewerage and irrigation projects up to the year 2020.

## Remote Control System

The first Remote Control System in the Drainage and Irrigation Department was completed in 1992 at a cost of Dh 2.9 million, and was designed to control the flow of wastewater by alter-


Remote Control System

ing it automatically when main wastewater stations reach their installed capacity, it also identifies whether pumps are or are not working, and pinpoints blockages and electrical and mechanical malfunctions.

In 2002, the system was upgraded at a cost of Dh 5.8 million, to cover a total of 138 drainage and irrigation pumping systems, providing information on any malfunctions and on the status of all stations and their daily operations. It also permitted constant monitoring of the working of the system and planning of regular maintenance.

## Treatment Efficiency

The treated wastewater has a high degree of purity, exceeding all international specifications for all biological, chemical and physical indicators approved for the measurement of quality level of water produced from wastewater treatment plants.

## Re-cycling of Treated Water

By the end of 2002, the amount of treated wastewater being produced by the plant had reached an average of 230,000 cubic metres a day, while the annual production had risen from 3,650.000 cu. m. to 84 million cu.m. This water is used for irrigation throughout the city.

The increase in production over the last three decades is illustrated in Table No. 2.

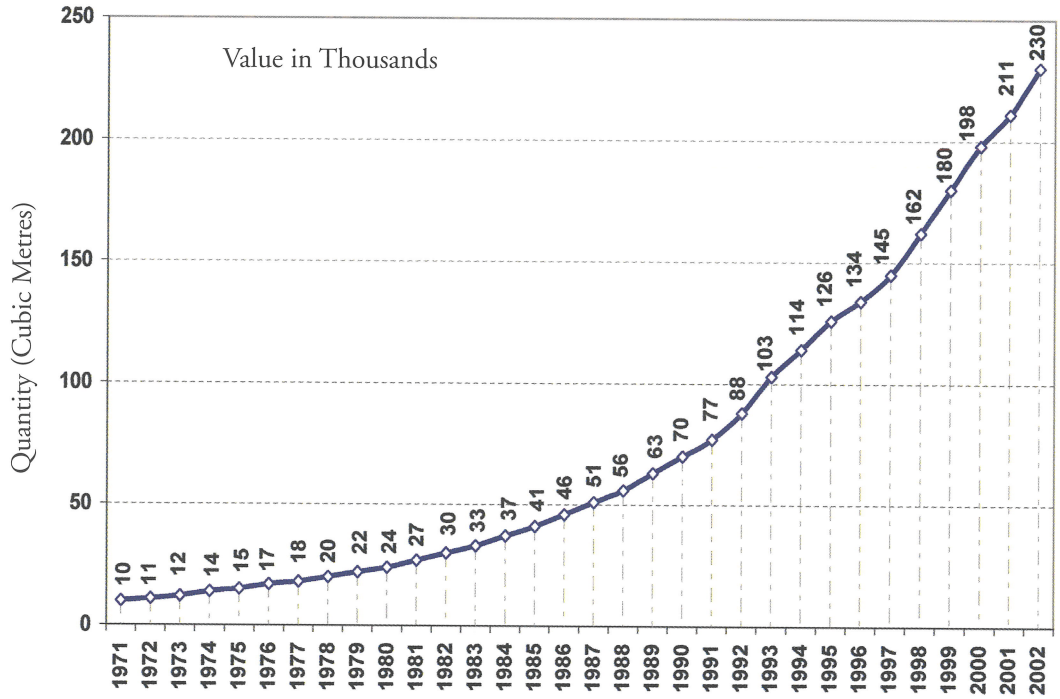
## Table No. 2. Treated water produced by the Wastewater Treatment Plant, 1971- 2002

| Year | Daily Average Cubic Metres * | Annual Quantity Cubic Metres * | Percentage of annual increase against the base year in 1971 | Percentage of increase compared to the previous year |
|---|---|---|---|---|
| 1971 | 10,000 | 3,650,000 | - | - |
| 1972 | 11,000 | 4,815,000 | 32% | 32% |
| 1973 | 12,000 | 4,880,000 | 33.7% | 1.3% |
| 1974 | 14,000 | 5,110,000 | 40% | 4.7% |
| 1975 | 15,000 | 5,475,000 | 50% | 7% |
| 1976 | 17,000 | 6,205,000 | 70% | 13% |
| 1977 | 18,000 | 6,570,000 | 80% | 5.9% |
| 1978 | 20,000 | 7,300,000 | 100% | 11% |
| 1979 | 22,000 | 8,030,000 | 120% | 10% |
| 1980 | 24,000 | 8,760,000 | 140% | 9.1% |
| 1981 | 27,000 | 9,855,000 | 170% | 12.5% |
| 1982 | 30,000 | 10,950,000 | 200% | 11.1% |
| 1983 | 33,000 | 12,045,000 | 230% | 10% |
| 1984 | 37,000 | 13,505,000 | 270% | 12.1% |
| 1985 | 41,000 | 14,965,000 | 310% | 10.8% |
| 1986 | 46,000 | 16,790,000 | 360% | 12.2% |
| 1987 | 51,000 | 18,615,000 | 410% | 10.9% |
| 1988 | 56,000 | 20,440,000 | 460% | 9.8% |
| 1989 | 63,000 | 22,995,000 | 530% | 12.5% |
| 1990 | 70,000 | 25,550,000 | 600% | 11.1% |
| 1991 | 77,000 | 28,000,000 | 667% | 9.6% |
| 1992 | 88,000 | 32,300,000 | 785% | 15.4% |
| 1993 | 103,000 | 37,500,000 | 927% | 16.1% |
| 1994 | 114,000 | 41,500,000 | 1,037% | 10.7% |
| 1995 | 126,000 | 45,900,000 | 1,158% | 10.6% |
| 1996 | 134,000 | 48,800,000 | 1,237% | 6.3% |
| 1997 | 145,000 | 53,000,000 | 1,352% | 8.6% |
| 1998 | 162,000 | 59,200,000 | 1,522% | 11.7% |
| 1999 | 180,000 | 65,600,00 (?) | 1,697% | 10.8% |
| 2000 | 198,000 | 72,100,000 | 1,875% | 9.9% |
| 2001 | 211,000 | 77,000,000 | 2,109% | 6.8% |
| 2002 | 230,000 | 84,000,000 | 2,301% | 9.1% |

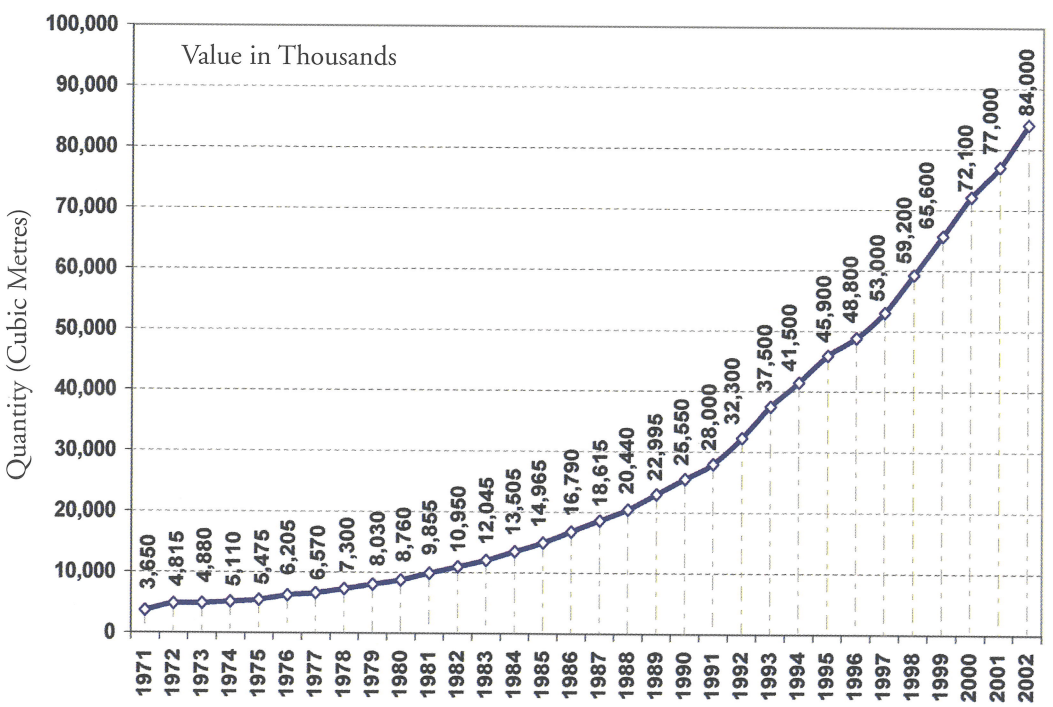


* 1 cubic metre = 220 gallons

## Daily Average Treated Water in Cubic Metres, 1971 – 2002




## Annual Average Treated Water in Cubic Metres, 1971 – 2002



Irrigation using wastewater

## The Irrigation Network

The expansion of wastewater treatment facilities, and the fact that the treated water being produced is of high quality, without germs or parasites, made it possible for it to be used for irrigation without harming public health or the environment.

The Municipality was, therefore, able to lay extensive irrigation networks throughout the city, these being supplied with pumping stations to ensure regular and even distribution. The irrigation systems themselves use sprinklers and drip-feed techniques that require high quality treated water.

## Development of the Irrigation System

During the 1970s,around 5,500 cubic metres of treated water a day were used for irrigating trees, along with around 4,000 cubic metres a day drawn from wells in the Al-Mizhar area. This cost approximately Dh 250,000 a year, and only hoses could be used, since it was not possible to introduce modern irrigation systems.

With the improvement of wastewater treatment, however, it became possible to lay modern electronically-controlled irrigation networks, with a consequent reduction in the number of manual labourers who formerly handled the process of watering. The new system also reduced

## Table No. 3. Average Pollution Indicators in wastewater inside the Plant, before and after treatment, in 2002

| Pollution Indicators | Concentration of incoming water milligram/ | Concentration of Treated water milligram/ Litre | Actual percentage of removal | Percentage of removal according to the Plant design |
|---|---|---|---|---|
| Biochemical Oxygen Demand BOD5 | Litre | 2.1 | 99.2% | 96% |
| Suspended Solids SS | 251 | 2.3 | 99% | 97% |
| Chemical Oxidation Demand COD | 251 | 34.6 | 94% | 94% |
| Ammonia NH3 | 571 | 6.9 | 80% | 95% |

wastage. By 2002, around 190,000 cubic metres a day of treated wastewater were being used, which would have been worth around Dh 345 million a year had it been necessary to use fresh water suitable for human consumption.

All of the parks in Dubai now have automated irrigation systems, with sprinklers for open, grassed areas, and drip-fed irrigation for trees and plants, all being controlled electronically and connected to a main monitoring centre:

This system allows for around 60 per of the watering to be done at night and 40 per cent during the day, thus balancing the demand on the system.

It also means that most watering at night can be done after midnight, when the parks are closed, permits watering to be undertaken in accordance with the needs of the plants, trees and grassed areas.

Electricity is also saved, by programming watering times while the automated system, means that all watering can be shut off in case of emergency or during periods of rainfall.

In order to ensure that the appropriate quality of treated water is produced and used, regularly laboratory analysis is carried out of liquid, solid and gaseous samples, collected throughout the day. Table No. 3 provides an indication of the efficiency of the wastewater treatment plant in terms of meeting international specifications.

In order to ensure that as much as possible of the treated wastewater is used, the Municipality has made use of it for public, as well as private projects. In 2002, it was estimated that there was a saving of around 69 million cubic metres of drinking water that would have been used if the treated wastewater had not been available, this representing a considerable contribution towards the Municipality's objectives of protecting the environment and of achieving sustainable development.

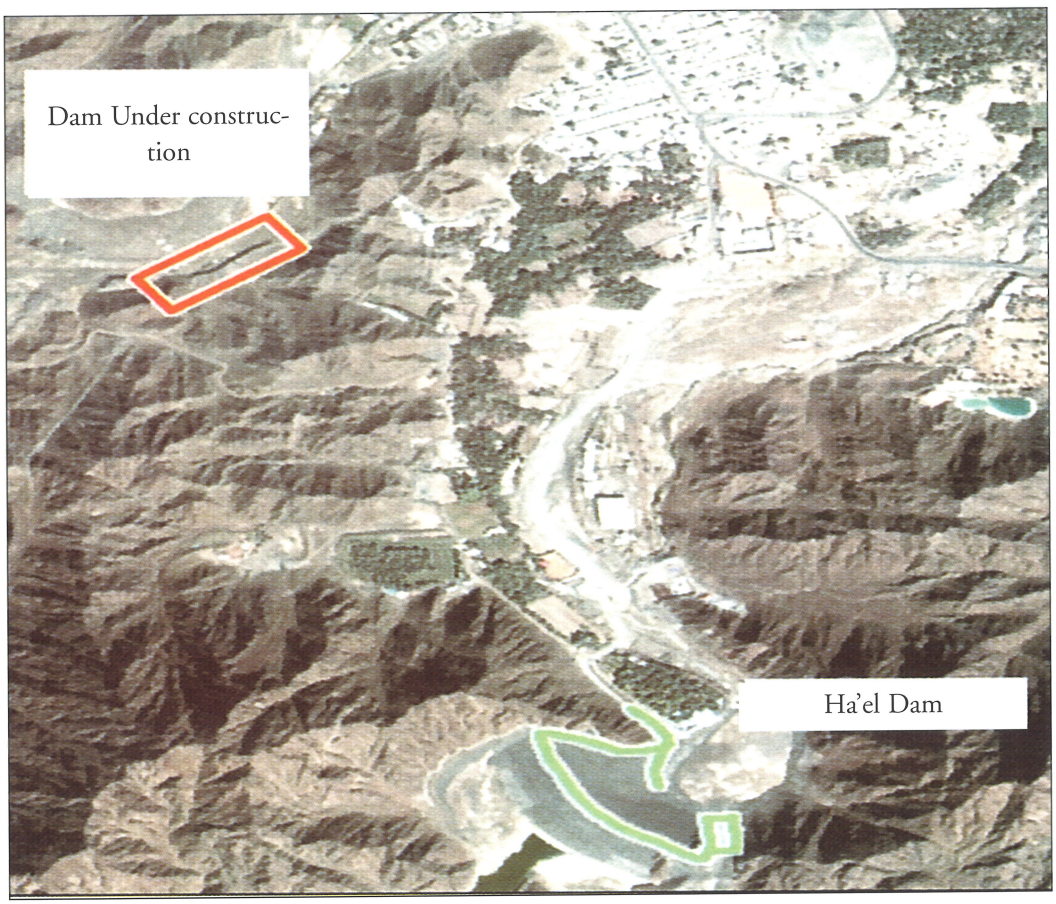
The Municipality also made use of the treated wastewater for other projects. Of these, one

was an 80-hectare farm using Rodus grass for fodder production. Using around 12,000 cubic metres of treated water a day, the farm produces approximately 50,000 bales of fodder a year for sale to consumers.

In the long term, the Municipality hopes to bring planting to around eight per cent of the total area of the Emirate of Dubai, including the cultivation of roadside verges and central reservations, parks, gardens and woodlands. The potential for the supply of treated water at a nominal price to projects such as the Dubai Internet City, the Dubai Investment complex and projects being built by Emaar is also being studied.

## Production of Organic Fertiliser from Waste Residue (Sludge)

The sludge, or waste residue from the various stages of treatment in the plant, is used to produce around 35 tons a day of high quality organic fertilizer, particularly suitable for use in sandy soils. Chemical analysis shows that it contains a concentration of 5.2% of nitrogen compounds, 6.2% of phosphorous compounds and 60% organic matter. This heat-treated fertiliser is classed as a Grade A fertiliser by the relevant authority in the United States.




Hatta Dams Project

## Hatta Dams

In line with the directives of H.H. the late Sheikh Rashid bin Saeed Al-Maktoum, UAE Vice President and Ruler of Dubai, plans were made to construct a number of small dams in Hatta during the 1970s and 1980s. Construction of these was planned and supervised by the Ruler's Office, at a cost of around Dh 7.8 million.

In 1997, the Drainage and Irrigation Department supervised the construction of a much larger damn, which cost Dh 58 million and was completed in February 1998.

The Municipality is now studying the possibility of building a further dam, which is estimated to cost Dh 36 million.

## Expenditure on drainage and irrigation projects

The following tables provide data of expenditure on drainage and irrigation projects.

Table No. 4 shows expenditure on sewerage and rainwater projects, including those which were completed before 1970, sewerage and rainwater drainage projects. Allowing for an average of five per cent as costs for consultants, the total amount spent has been around Dh 4.192 billion.

Table No. 5 covers irrigation projects from 1980 – 2002, as well as projects carried out before 1980. Total cost was Dh 391,591,378.

Table No. 6 and the associated graph shows the total expenditure on sewerage, rainwater drainage and irrigation projects between 1970 and 2002, and also shows those projects completed before 1970.

### Table No. 4. Sewerage and rainwater drainage projects, 1970 – 2002

| No | Project No. | Project | Contract Value (in Dhs.) | Date of Completion |
|---|---|---|---|---|
| 1 | D1 | Drainage Network for Dubai (Phase One) | 37,856,551 | April 1974 |
| 2 | D2 | Drainage Network for Dubai (Phase Two) | 97,784,785 | August 1976 |
| 3 | D7 (1:6) | Treated Wastewater Lines | 9,889,570 | February 1978 |
| 4 | D2A | Drainage Network for Dubai (Phase Two) Continuation | 147,865,851 | January 1979 |
| 5 | | Drainage Network for Dubai (Phase Three) | 14,865,852 | January 1979 |
| 6 | D10 | Drainage Lines for Al-Shabab and Al-Wasl Clubs | 1,293,428 | July 1979 |
| 7 | D3 (1:9) | Additional Works – Expansion of Treatment Plant | 15,420,000 | April 1980 |
| 8 | D4 | Additional Works – Expansion of Treatment Plant | 972,725 | June 1980 |
| 9 | D8 | Drainage Network – Deira | 48,686,522 | September 1980 |
| 10 | DM1 | Development of Treatment Plant in Al-Garhoud | 10,309,976 | January 1981 |
| 11 | DS13 | Drainage Networks in Al-Ra's | 1,710,120 | March 1981 |
| 12 | M01/80 | Fermentation Tanks in the Treatment Plant | 1,269,463 | April 1981 |

## Table No. 4.

| No | Project No. | Project | Contract Value (in Dhs.) | Date of Completion |
|---|---|---|---|---|
| 13 | D12 | Drainage Networks for Dubai | 25,309,959 | July 1981 |
| 14 | D11 | Drainage Networks for Dubai Zoo | 128,370 | September 1981 |
| 15 | D3 | Expansion of the Sewage Treatment Plant | 50,406,908 | November 1981 |
| 16 | D11 | Drainage Lines for Port Saeed and Al-Khebaisi areas | 14,633,368 | August 1982 |
| 17 | DS14 | Expansion of the drainage project in Deira | 10,703,942 | August 1982 |
| 18 | DS | Additional works – expansion of the Treatment Plant | 6,404,944 | September 1982 |
| 19 | DS19 | Drainage line for Al-Garhoud Street showrooms | 546,625 | November 1982 |
| 20 | DM2 | Maintenance work for the Treatment Plant | 9,029,326 | February 1983 |
| 21 | DS50 | Soil Tests for the Sewage Treatment Plant Project | 4,767,565 | February 1983 |
| 22 | DRI50 | Rainwater Network in Al-Sabkha Market | 2,790,729 | March 1983 |
| 23 | D8(1:38) | Pump Station for Deira | 17,271,961 | July 1983 |
| 24 | DS22 | Construction of crossing points for drainage lines | 1,956,707 | September 1983 |
| 25 | DS16 | Expansion of sewage treatment plant in Al-Garhoud | 10,104,772 | October 1983 |
| 26 | DS15 | Drainage Network for Zabeel | 8,696,555 | May 1984 |
| 27 | DS9 | Drainage lines for Al-Wasl and Al-Safa Streets | 30,243,663 | September 1984 |
| 28 | D2AC | Drainage Network for Dubai | 268,937,935 | January 1985 |
| 29 | DS18 | Construction of a tank and pump station for treated water | 10,957,795 | March 1985 |
| 30 | DS23 | Drainage network for Dubai Police headquarters | 1,432,859 | April 1985 |
| 31 | DS24 | Drainage network for Al-Wasl Street | 4,844,051 | July 1985 |
| 32 | DS30 | Drainage network for Hor Al-Anz | 66,000,000 | July19 85 |
| 33 | DS31 | Drainage network for Hor Al-Anz | 63,000,000 | July 1985 |
| 34 | DS26 | Construction of crossing point in Al-Dhiyafa Street | 274,909 | September 1985 |
| 35 | DS27 | Drainage Network for Khaled Bin Al-Walid Street | 1,062,044 | September 1985 |
| 36 | DS29 | Settlement work for Al-Rashidiya | 2,700,883 | November 1985 |
| 37 | DS25 | Drainage network for Al-Wasl Hospital and Al-Wasl Club | 3,405,932 | December 1985 |
| 38 | DS33 | Labour Housing in Al-Qusais | 517,251 | January 1986 |
| 39 | MO2/80 | Repairs to units in the treatment plant | 658,028 | May 1986 |
| 40 | DS34 | Drainage network for Al-Dhiyafa Street | 3,751,284 | September 1986 |
| 41 | DS42 | Urgent drainage work | 22,291,896 | January 1987 |
| 42 | DS32 | Water pipelines for the Municipality building | 342,422 | April 1987 |

## Table No. 4.

| No | Project No. | Project | Contract Value (in Dhs.) | Date of Completion |
|---|---|---|---|---|
| 43 | DS43 | Drainage point for groundwater and rainwater in Al-Quoz | 1,566,641 | July 1987 |
| 44 | DS28 | Connections to homes and small works | 34,311,531 | August 1987 |
| 45 | DS36 | Drainage point for rainwater in Al-Khor | 5,160,272 | November 1087 |
| 46 | DS40 | Pump station in Al-Murar district & a drainage point for rainwater | 1,760,761 | November 1987 |
| 47 | DS52 | Main pumping stations | 301,310,990 | February 1989 |
| 48 | DS45 | Residential connection and urgent works | 23,266,020 | May 1989 |
| 49 | DS62 | New (B) Pumping Station | 1,918,311 | June 1989 |
| 50 | DS46 | Rainwater drainage for Dubai Airport | 5,842,596 | September 1989 |
| 51 | DS 48/3 | Drainage networks for Al-Rashidiyah | 7,500,000 | October 1989 |
| 52 | DS 41 | Drainage network for Al-Kafaf | 9,861,325 | November 1989 |
| 53 | DS 35/1 | Maintenance of Municipality building | 3,500,000 | June 1990 |
| 54 | DS39 | Pump station and drainage network | 7,812,992 | June 1990 |
| 55 | DS39/2 | Development of treatment plant system | 7,931,644 | July 1990 |
| 56 | DS 80 | Residential connections and urgent works | 25,551,029 | November 1990 |
| 57 | DS54 | Rainwater drainage in Al-Karamah | 43,085,531 | March 1991 |
| 58 | DS53 | Drainage network in Al-Safa | 41,000,000 | June 1991 |
| 59 | DS48/1 | Drainage network in Al-Rashidiya | 47,000,000 | August 1991 |
| 60 | DS49 | Drainage network in Al-Tawar | 27,000,000 | October 1991 |
| 61 | DS70 | Sewage drainage line from Al-Sadiya roundabout to pump station (E) | 30,058,424 | October 1991 |
| 62 | DS48/2 | Drainage network in Al-Rashidiya | 31,000,000 | December 1991 |
| 63 | DS51 | Wastewater treatment plant in Al-Aweer | 399,929,336 | December 1991 |
| 64 | DS69/1 | Drainage network in Al-Satwa (first phase) | 3,811,000 | April 1992 |
| 65 | DS72/1 | Rainwater drainage in Al-Shandagha – first phase | 12,450,092 | August 1992 |
| 66 | DS90 | Residential connections and urgent works | 15,929,378 | July 1993 |
| 67 | DS83/1/A | Maintenance and development of drainage networks in Bur Dubai | 36,474,460 | July 1993 |
| 68 | DS 83/B | Maintenance & develop. of drainage network in Bur Dubai (second phase) | 41,500,000 | July 1993 |
| 69 | DS85 | Remote control system | 2,780,638 | November 1993 |
| 70 | DS64/1 | Drainage and rainwater network in Al-Mankhool | 28,380,217 | June 1994 |
| 71 | DS95/2 | Rainwater drainage line for the Government Garage | 2,332,684 | June 1994 |
| 72 | DS61/1 | Rainwater and Drainage network in Al-Zabeel – first phase | 3,699,813 | February 1995 |

## Table No. 4.

| No | Project No. | Project | Contract Value (in Dhs.) | Date of Completion |
|---|---|---|---|---|
| 73 | DS69/3/A | Main pumping station for rainwater drainage in Al-Satwa | 22,164,682 | May 1995 |
| 74 | DS68/1 | Rainwater drainage in Jumeirah and Al-Safa – first phase | 31,270,941 | July 1995 |
| 75 | DS69/2 | Drainage network in Al-Satwa (second phase) | 114,687,400 | December 1995 |
| 76 | DS95 | Residential connections and urgent works | 18,754,534 | March 1996 |
| 77 | DS67 | Drainage project for Al-Mamzar and Al-Wahida areas | 32,251,780 | June 1996 |
| 78 | DS68/2 | Sewage & rainwater drainage in Jumeirah & Al-Safa – second phase | 38,405,000 | February 1997 |
| 79 | DS83/2A | Develop. & maintenance of drainage networks in Deira (second & third phase) | 20,000,000 | March 1997 |
| 70 | DS71/1 | Drainage of rainwater in Al-Riqqa and Al-Mateina areas | 38,056,224 | April 1997 |
| 81 | DS71/2 | Drainage networks in Al-Riqqa and Al-Mateina areas | 37,500,000 | April 1997 |
| 82 | DS6/3 | Sewage & rainwater drainage in Jumeirah and Al-Safa – phase three | 43,998,854 | May 1997 |
| 83 | 77DS77 | Sewage and rainwater drainage in Al-Tawar – second phase | 34,913,923 | June 1997 |
| 84 | DS87/3 | Hydrological study for Dubai City, storage of irrigation water | 1,700,000 | July 1997 |
| 85 | DS105 | Residential connections and urgent works | 13,499,240 | August 1997 |
| 86 | DS83/2-1 | Develop. & maintenance of drainage networks – Deira section (B) first phase | 15,877,440 | October 1997 |
| 87 | DS83/3-2&3 | Develop. & maintenance of drainage networks – Deira sections 2&3 | 14,808,240 | December 1997 |
| 88 | DS87/1 | Hydrological Study | 1,794,888 | December 1997 |
| 89 | 83/3-1 | Develop. & maintenance of drainage networks – Deira, part 3/1 | 16,800,000 | December 1997 |
| 90 | DS105/1 | Residential connections and urgent works | 4,047,554 | January 1998 |
| 91 | DS96 | General plan for drainage networks | 2,000,000 | January 1998 |
| 92 | DS57 | Sewage and rainwater drainage – Al-Garhoud | 29,243,666 | February 1998 |
| 93 | DS75/3 | Construction of dams in Hatta | 54,890,047 | June 1998 |
| 94 | DS68 | Sewage and rainwater drainage in Jumeirah and Al-Safa | 50,000,000 | July 1998 |
| 95 | DS32/2 | Development of drainage networks – second phase | 30,000,000 | July 1998 |
| 96 | DS68/5 | Sewage and rainwater drainage in Jumeirah and Al-Safa – fifth phase | 54,634,956 | October 1998 |
| 97 | DS68/4 | Sewage & rainwater drainage in Jumeirah & Al-Safa – fourth phase | 50,000,000 | March 1999 |
| 98 | DS69/3A | Drainage networks in Al-Satwa – phase three A | 21,678,217 | June 1999 |
| 99 | DS103 | Sewage and drainwater project for Al-Quoz residential area | 48,856,299 | June 1999 |
| 100 | DS69 | Drainage for Al-Satwa | 26,270,071 | June 1999 |
| 101 | DS107 | Sewage and rainwater drainage project for Port Saeed | 18,400,000 | July 1999 |
| 102 | DS110 | Residential connections and urgent works | 20,994,060 | August 1999 |

## Table No. 4.

| No | Project No. | Project | Contract Value (in Dhs.) | Date of Completion |
|---|---|---|---|---|
| 103 | DS104 | Sewage & rainwater drainage project for Nad Al-Sheba & Ra's Al-Khor | 52,607,302 | January 2000 |
| 104 | DS68/6 | Sewage & rainwater drainage project for Jumeirah & Al-Safa – sixth phase | 54,172,244 | May 2000 |
| 105 | DS64/2B | Sewage and rainwater drainage project for Al-Mankhool B | 35,503,247 | June 2000 |
| 106 | DS68/9 | Sewage & rainwater drainage project for Jumeirah a& Al-Safa – ninth phase | 25,700,000 | June 2000 |
| 107 | DS64/2A | Drainage of sewage and rainwater – Al-Mankhool 2 | 39,831,887 | July 2000 |
| 108 | DS68/1A | Sewage & rainwater drainage project for Jumeirah & Al-Safa – first phase A | 19,440,000 | July 2000 |
| 109 | DS68/8 | Sewage & rainwater drainage project for Jumeirah & Al-Safa – eighth phase | 44,161,242 | September 2000 |
| 110 | DS68/7 | Sewage & rainwater drainage project for Jumeirah & Al-Safa – seventh phase | 87,333,858 | January 2001 |
| 111 | DS108 | Rainwater drainage for Al-Ramool Industrial area | 28,452,300 | February 2001 |
| 112 | DS100 | Expansion of treatment plant in Al-Aweer | 294,960,193 | March 2001 |
| 113 | DS68/12 | Sewage & rainwater drainage project for Jumeirah & Al-Safa – twelfth phase | 13,019,375 | April 2001 |
| 114 | DS61/2 | Rainwater lakes at Camel Racetrack – Nad El-Sheba | 40,140,000 | June 2001 |
| 115 | DS163 | Drainage in Zabeel – second phase | 4,741,000 | September 2001 |
| 116 | DS86 | Main lift station for pump station E | 48,570,465 | September 2001 |
| 117 | DS120 | Residential connections and urgent works | 19,800,000 | October 2001 |
| 118 | DS68/10 | Sewage & rainwater drainage project for Jumeirah & Al-Safa – tenth phase | 19,779,000 | November 2001 |
| 119 | DS109 | Sewage and rainwater drainage project for Al-Qusais (232) | 24,312,000 | December 2001 |
| 120 | DS111 | Sewage and rainwater drainage project for Al-Qusais (232) | 12,750,089 | March 2002 |
| 121 | DS106B | Sewage and rainwater drainage project for Nad Al-Sheba area B | 41,757,043 | May 2002 |
| 122 | DS85/3/4 | Development of drainage networks – third phase, part 4 | 34,856,480 | June 2002 |
| 123 | DS106 | Sewage and rainwater drainage project for Nad Al-Sheba area A | 55,163,121 | October 2002 |
| 124 | DS119 | Expansion of remote control system | 5,654,360 | December 2002 |
| 125 | DS172 | Adjustments to pump lines | 47,308,000 | December 2002 |

## Table No. 5. Irrigation Projects, 1980 – 2002

| No | Project No. | Project Name | Contract Value | Date of Completion |
|---|---|---|---|---|
| 1 | Internal | Irrigation system for Maydan Al-Ittihad Park – Deira | 1,440,000 | November 1980 |
| 2 | IR – 11 | Irrigation water line – Zabeel | 4,328,754 | April 1981 |
| 3 | Internal | Irrigation system for Mushrif Park | 1,200,000 | December 1984 |
| 4 | Internal | Irrigation system for Naif Park | 250,000 | June 1985 |
| 5 | Internal | Irrigation system for Zabeel Park | 250,000 | September 1985 |
| 6 | IR – 5 | Irrigation System for Port Rashid | 800,000 | June 1987 |
| 7 | IR – 6 | Irrigation system for Zabeel Street 2 | 2,124,152 | October 1987 |
| 8 | IR – 9 | Irrigation system for Al-Wahida Street | 2,500,000 | November 1989 |
| 9 | IR -11 | Irrigation system for Oud Maitha Street | 1,681,455 | February 1990 |
| 10 | IR -13 | Drilling Wells on Al-Aweer Road | 1,650,000 | January 1990 |
| 11 | IR -17 | Irrigation system for Al-Mankhool Street | 1,215,000 | November 1990 |
| 12 | IR -18/1 | Irrigation system for Al Ain Road (first phase) | 2,800,000 | December 1990 |
| 13 | IR -21 | Irrigation system for Abu Hail Road | 2,366,071 | July 1991 |
| 14 | SAFA P. | Development of Al-Safa Park | 48,244,654 | July 1992 |
| 15 | IR -14/5 | Irrigation system for Mushrif nature reserve (first phase) | 2,313,308 | October 1992 |
| 16 | IR -10 | Irrigation system for Al-Khaleej Street | 2,356,398 | December 1992 |
| 17 | IR -28 | Irrigation system for Oud Maitha Street (first phase) | 1,463,000 | October 1992 |
| 18 | IR -18/2 | Irrigation system for Al Ain Road (second phase) | 2,415,587 | November 1992 |
| 19 | IR -12 | Irrigation system for Al-Rashid Street | 996,000 | August 1993 |
| 20 | IR -18/3 | Irrigation system for Al Ain Road (third phase) | 1,871,600 | April 1994 |
| 21 | IR -19 | Irrigation system for Al-Aweer Street | 2,897,000 | April 1995 |
| 22 | IR -26 | Irrigation system for Al-Qusais Street | 3,951,572 | August 1995 |
| 23 | IR -32 | Irrigation system for Sheikh Zayed Road (first phase) | 3,280,000 | May 1996 |
| 24 | IR -34 | Irrigation system for Sheikh Zayed Road (second phase) | 3,923,185 | May 1996 |
| 25 | DS81/1 | General Plan for irrigation networks (first phase) | 16,120,937 | July 1996 |
| 26 | IR -14/6 | Irrigation system of Mushrif nature reserve (second phase) | 2,639,382 | November 1996 |
| 27 | IR -37 | Irrigation system for Jumeirah Street | 3,255,824 | January 1997 |
| 28 | IR -30 | Irrigation system for Al Ain Road | 5,300,000 | March 1997 |
| 29 | DS20 | Main irrigation network for Deira | 27,709,802 | March 1997 |
| 30 | IR -35 | Irrigation system for the Municipality's fodder farm in Al-Aweer | 3,041,120 | March 1997 |

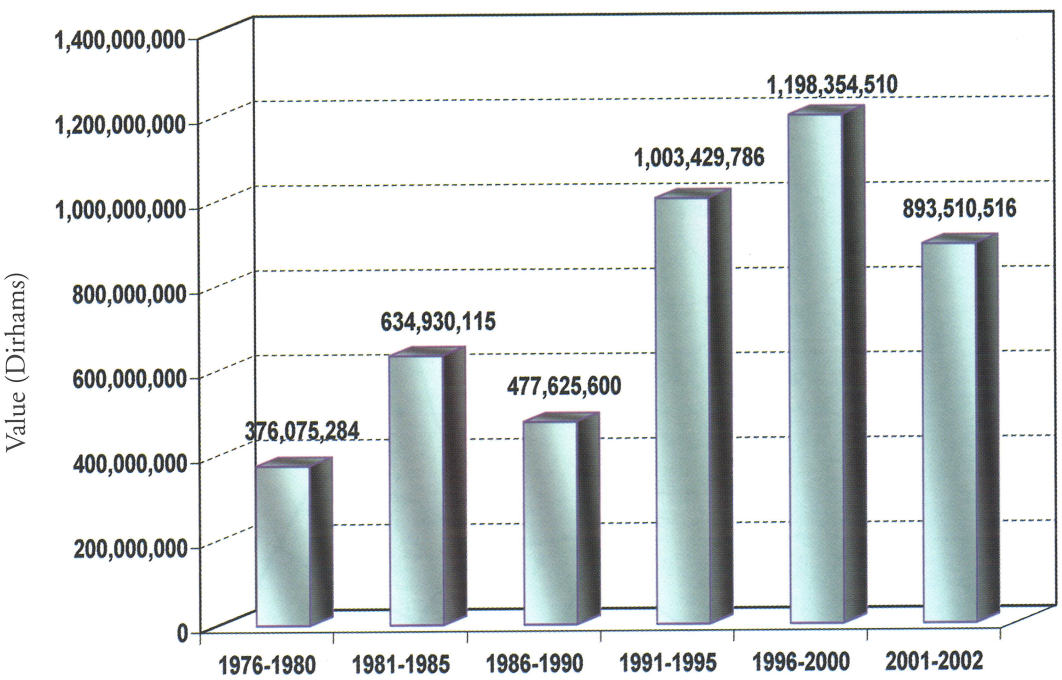
## Table No. 5.

| | | | | |
|---|---|---|---|---|
| 31 | DS19 | Main irrigation network in Bur Dubai | 41,705,288 | June 1997 |
| 32 | IR -41 | Irrigation system for Commercial Centre Street, between Burjuman interchange & Sana interchange | 1,537,409 | June 1997 |
| 33 | IR-42 | Irrigation system for Oud Maitha Street | 1,639,852 | July 1997 |
| 34 | IR -43 | Irrigation system for Street | 1,779,057 | July 1997 |
| 35 | IR -45 | Irrigation system for Sheikh Zayed Street between Trade Centre roundabout and Holiday Inn Hotel | 2,118,320 | June 1997 |
| 36 | IR -33 | Irrigation system for various areas in Dubai | 4,372,035 | August 1997 |
| 37 | IR -38 | Irrigation system for Al-Wasl Street | 2,348,000 | October 1998 |
| 38 | IR -48 | Irrigation system for entrance of Zabeel Palace | 1,518,530 | January 1999 |
| 39 | IR -81/2 | General Plan for irrigation networks (second phase) | 45,492,632 | January 1999 |
| 40 | IR -46 | Irrigation system for Al-Ramool Street | 2,952,000 | March 1999 |
| 41 | IR -49 | Irrigation system for Al-Qataiyat Street | 4,141,400 | October 1999 |
| 42 | IR -50 | Automatic irrigation system for Oud Maitha – Al-Qataiyat Street interchange | 3,153,000 | October 1999 |
| 43 | IR -54 | Irrigation system for Shooting Club | 650,000 | August 1999 |
| 44 | IR -39 | Main irrigation network for Zabeel Street 2 | 1,448,400 | November 1999 |
| 45 | IR -47 | Irrigation system for Trade Centre Road between Burjuman interchange and Sana interchange | 2,650,772 | January 2000 |
| 46 | IR -51 | Irrigation system for various areas in Dubai (first phase) | 4,786,650 | November 2000 |
| 47 | IR -62 | Irrigation system for Airport Road | 5,014,717 | December 2001 |
| 48 | IR -24 | Irrigation system for Nad Al-Hamar Road – first phase | 4,282,145 | June 2001 |
| 49 | IR -40 | Irrigation system for Nad Al-Hamar Road – second phase | 4,440,000 | March 2001 |
| 50 | IR -44 | Irrigation system for Al-Abraj Street | 4,831,092 | July 2001 |
| 51 | IR – 52 | Irrigation system for Al-Ittihad Street | 3,725,697 | December 2001 |
| 52 | IR -53 | Irrigation system for Al-Qusais Street | 4,359,100 | March 2001 |
| 53 | IR -59 | Irrigation system for Sheikh Zayed University Street | 1,862,214 | January 2001 |
| 54 | IR -61 | Irrigation system for Zabeel streets | 2,100,000 | April 2001 |
| 55 | IR -67 | Irrigation system for nature reserves | 1,060,000 | November 2001 |
| 56 | IR -149/1 | Main irrigation system for Jebel Ali (1) | 34,315,915 | July 2002 |
| 57 | IR -149/2 | Main irrigation system for Jebel Ali (2) | 41,389,680 | July 2002 |
| 58 | IR -55 | Irrigation system for Dubai Ring Road | 3,202,197 | July 2002 |
| 59 | IR -85 | Irrigation system for Nad Al-Sheba Nursery | 988,246 | July 2002 |
| 60 | IR -69 | Irrigation system for the Emirates Road – phase 4 | 3,342,229 | September 2002 |
| Total Cost | | | 391,591,378 Dirham | |

## Table No. 6. Expenditure on Irrigation and Sewage and Rainwater Drainage Projects

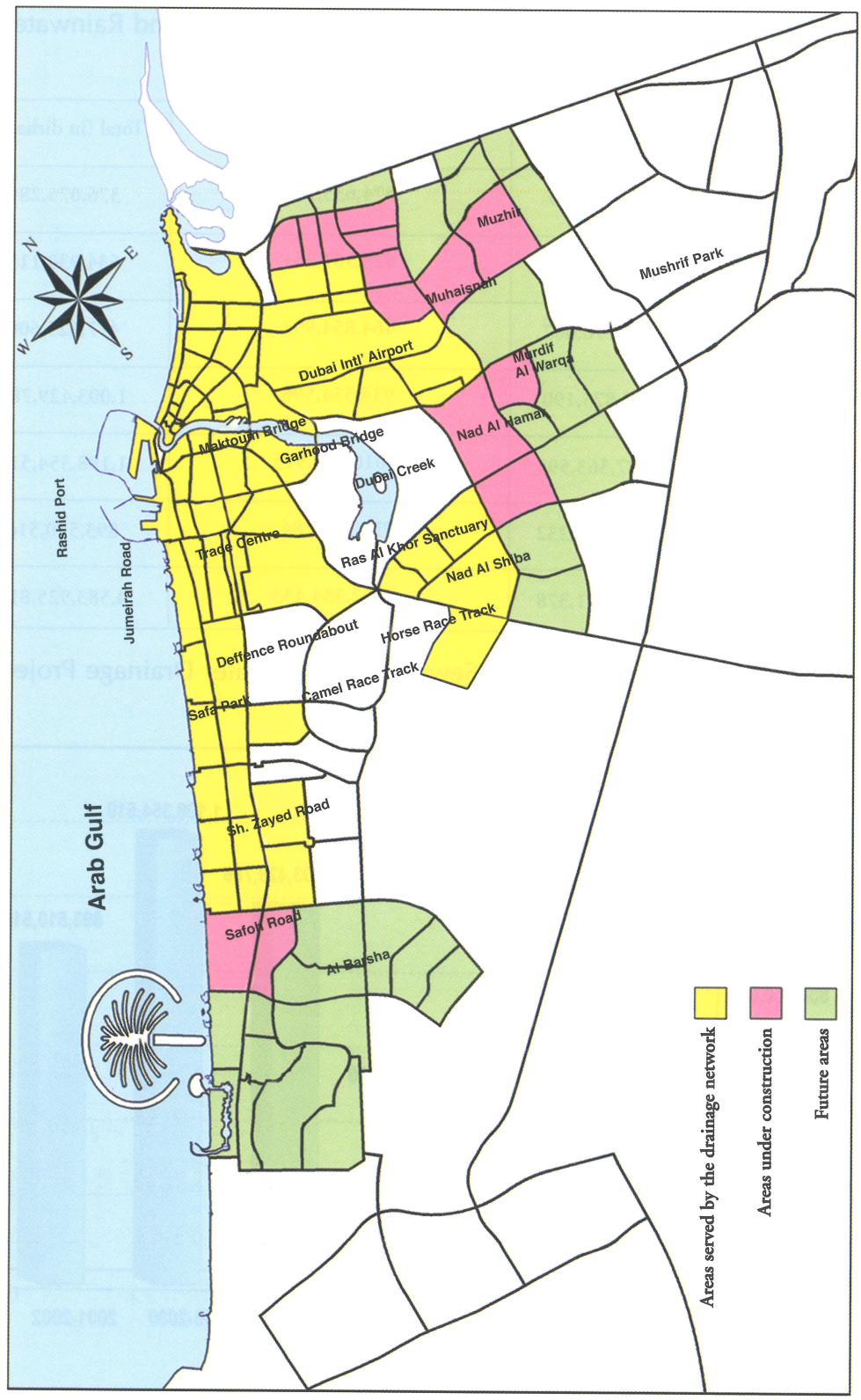
| Year | Irrigation Projects | Sewage and Rainwater Drainage Projects | Total (in dirhams) |
|---|---|---|---|
| 1976-1980 | 1,440,000 | 374,635,284 | 376,075,284 |
| 1981-1985 | 6,028,754 | 628,901,361 | 634,930,115 |
| 1986-1990 | 12,770,607 | 464,854,993 | 477,625,600 |
| 1991-1995 | 68,875,190 | 934,554,596 | 1,003,429,786 |
| 1996-2000 | 187,563,595 | 1,010,790,915 | 1,198,354,510 |
| 2001-2002 | 114,913,232 | 778,597,284 | 893,510,516 |
| Total Expenditure | 391,591,378 | 4,192,334,433 | 4,583,925,811 |

## Expenditure on Irrigation and Sewage and Rainwater Drainage Projects, 1976 – 2002




Total expenditure up to 2002: 4,583,925,811 Dirhams.

## Drainage Projects



# Historical Development of the Public Parks and Horticulture Department

The Horticulture Section of the Dubai Municipality, as it was then known, was set up in 1972 to take responsibility for the management of afforestation and of maintaining and increasing other planted areas, in association with other units of the Municipality. Help was sought from an Iranian agronomist who advised the planting of roadside verges with trees that could survive both the harsh weather and a limited water supply.

Making use of the limited resources available, the department began a programme of planting, using imported seeds and irrigating with groundwater extracted from wells. Among the work undertaken was the planting of the first two large parks, Mushrif Park, planted in 1974 and Al-Safa Park, planted in 1975. Trees were also planted along some roadside verges.

At the beginning of the 1980s, the completion of the Sewage Treatment Plant provided ample supplies of treated wastewater that was suitable for sprinklers and drip-feed systems. This made it possible to increase the extent of planted areas substantially, while the organic fertiliser produced by the plant was also put to good use. More employees were taken on, dealing both with horticulture and landscaping, while in 1982 the Hor Al-Anz nursery was established to produce tree saplings, shrubs, succulents and flowering plants, these being selected for their adaptability to local climatic conditions.

In the same year, a dedicated Horticulture Section was established, which succeeded in completing 65 new projects over the subsequent five years, including landscaping of streets, cultivation of playing fields and roundabouts and establishment of gardens in residential areas.

## 1 - Landscaping of Streets and Roundabouts

Landscaping of streets and roundabouts included work in Al-Riqqa Street and Al-Muraggabat Street, and adjacent to traffic underpasses, while the Trade Centre roundabout was also planted at the time of the 1986 Chess Olympics.

## 2 - Parks

Two important parks were also completed, in Maydan Al-Ittihad (Al-Ittihad Square) in 1982 and Nayef Park in 1985.

## 3 - Playgrounds

At the beginning of February 1985, work also began on the cultivation of playing fields at the Al-Ahli, Al-Nasr and Al-Shabab Clubs.

The development of the Municipality's own nurseries played an important part in facilitating the work of the section.

## 4 - Nurseries

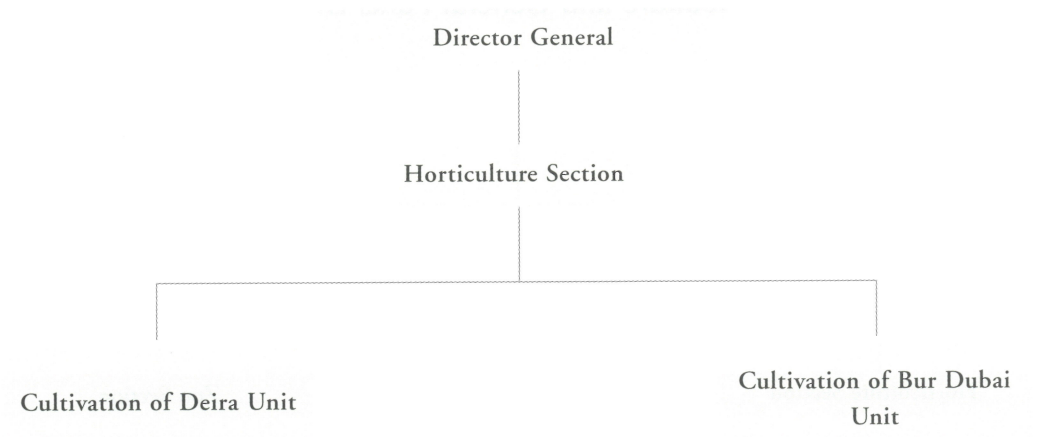
In 1985, approval was given for the setting up of a greenhouse while shaded areas for cultivation of plants were also increased.

By the end of this year, the planted area in Dubai had risen to 334,911 sq. metres, an increase of 42.6 per cent from over the figure at the end of 1982, while a total of 485,009 trees had been planted, an increase of 85.3 per cent over the December 1982 figure.

## Administrative Development

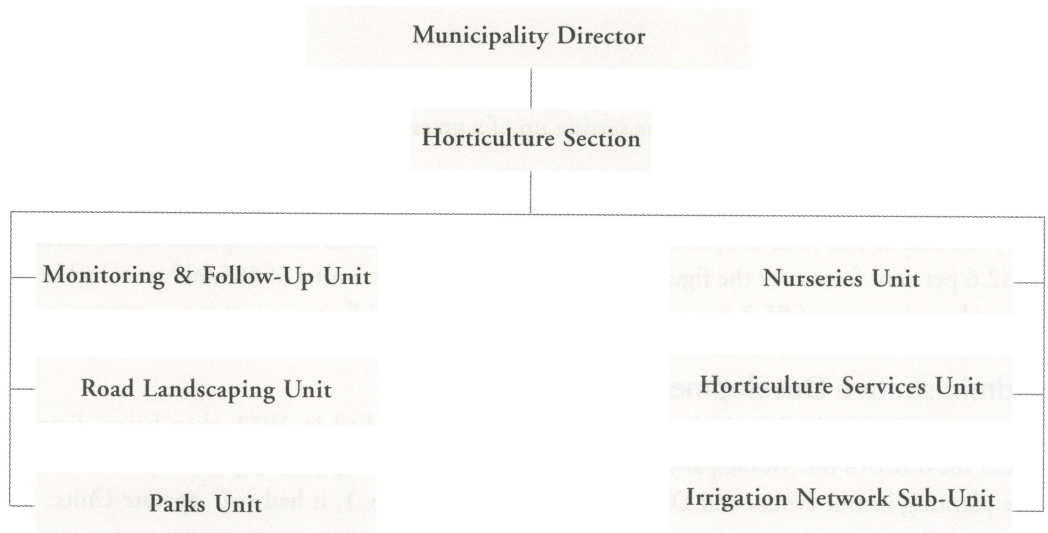
As noted above, the Horticulture Section was first established in 1972, then being directly under the office of the Municipality Director, and being given responsibility for horticulture and tree-planting in Bur Dubai and Deira. As shown in Chart No. 1, it had two separate Units.

### Chart No. 1. Horticulture Section in 1972



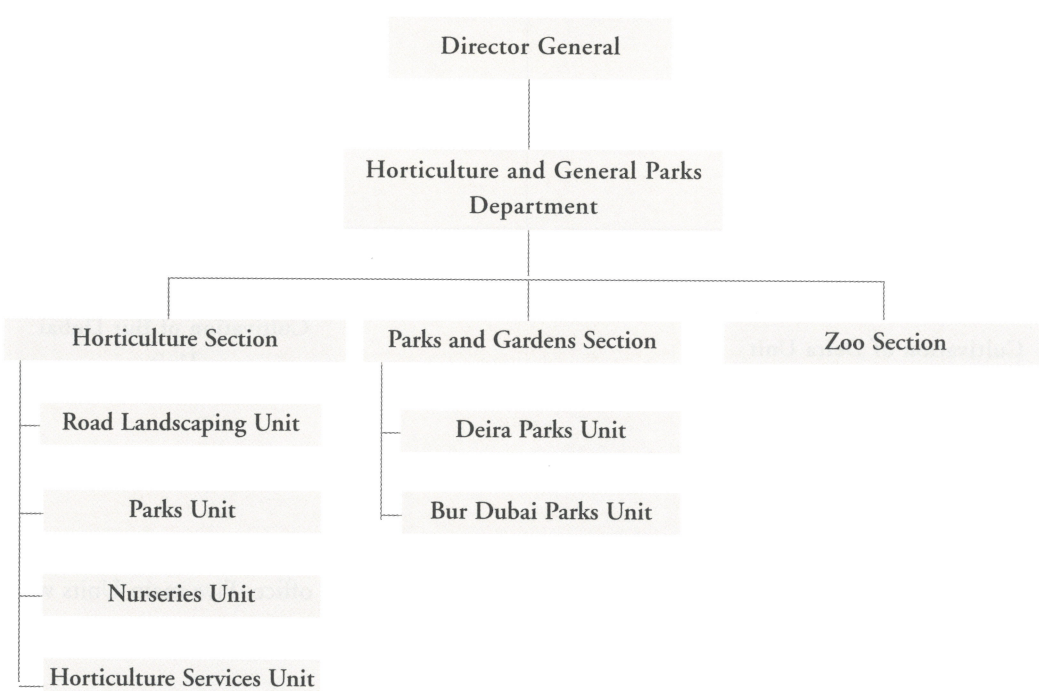

In 1987, the organisational chart was revised, with six separate units being established, although the Section remained directly affiliated to the Director's office. Five main Units were created as well as an Irrigation Network sub-unit, as shown in Chart No. 2.

## Chart No. 2. Organisation Chart in 1987



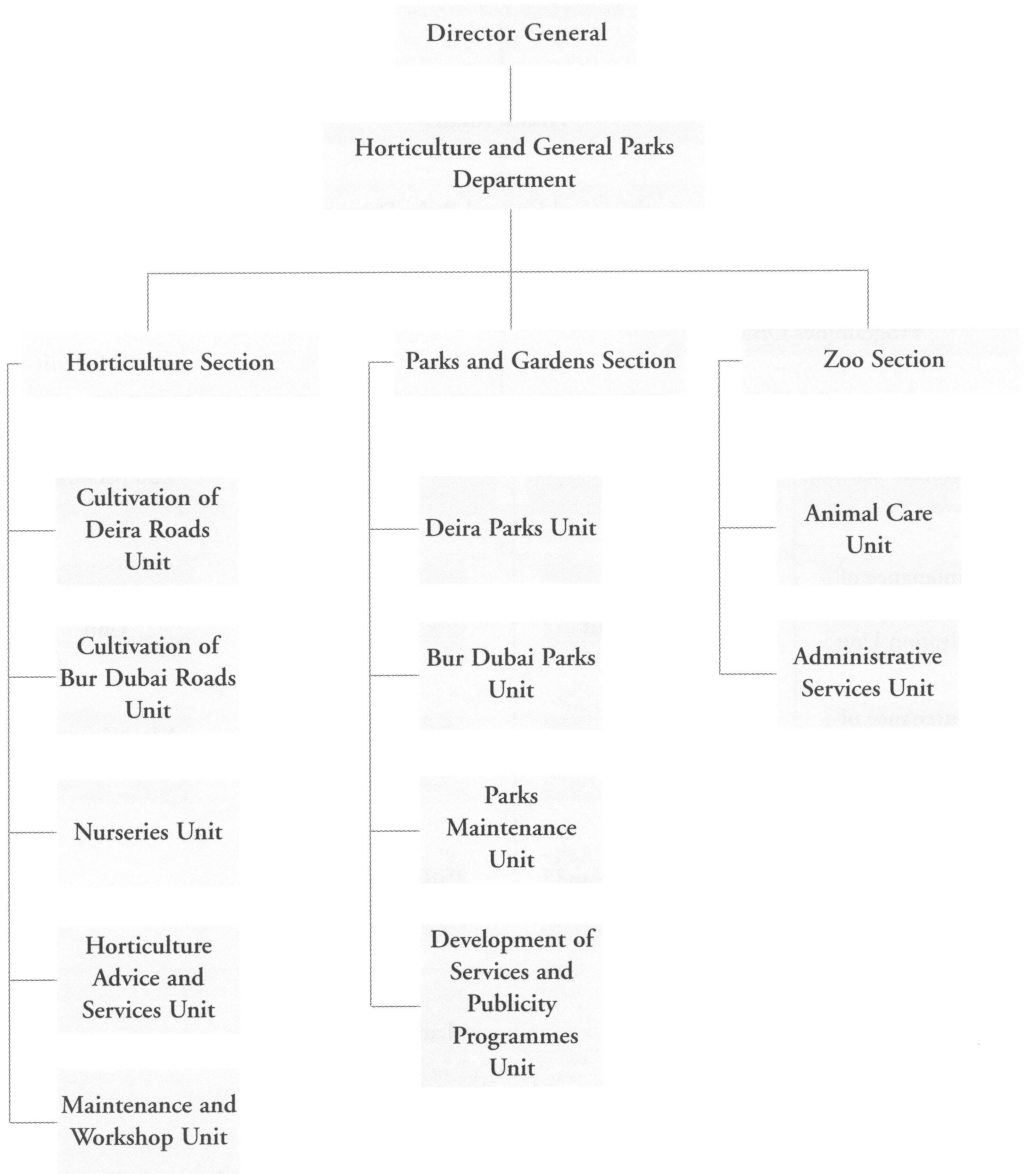

In 1991, there was a further revision to the structure, with the establishment of the Horticulture and General Parks Department, as shown in Chart No. 3.

## Chart No. 3. Horticulture and General Parks Department in 1991



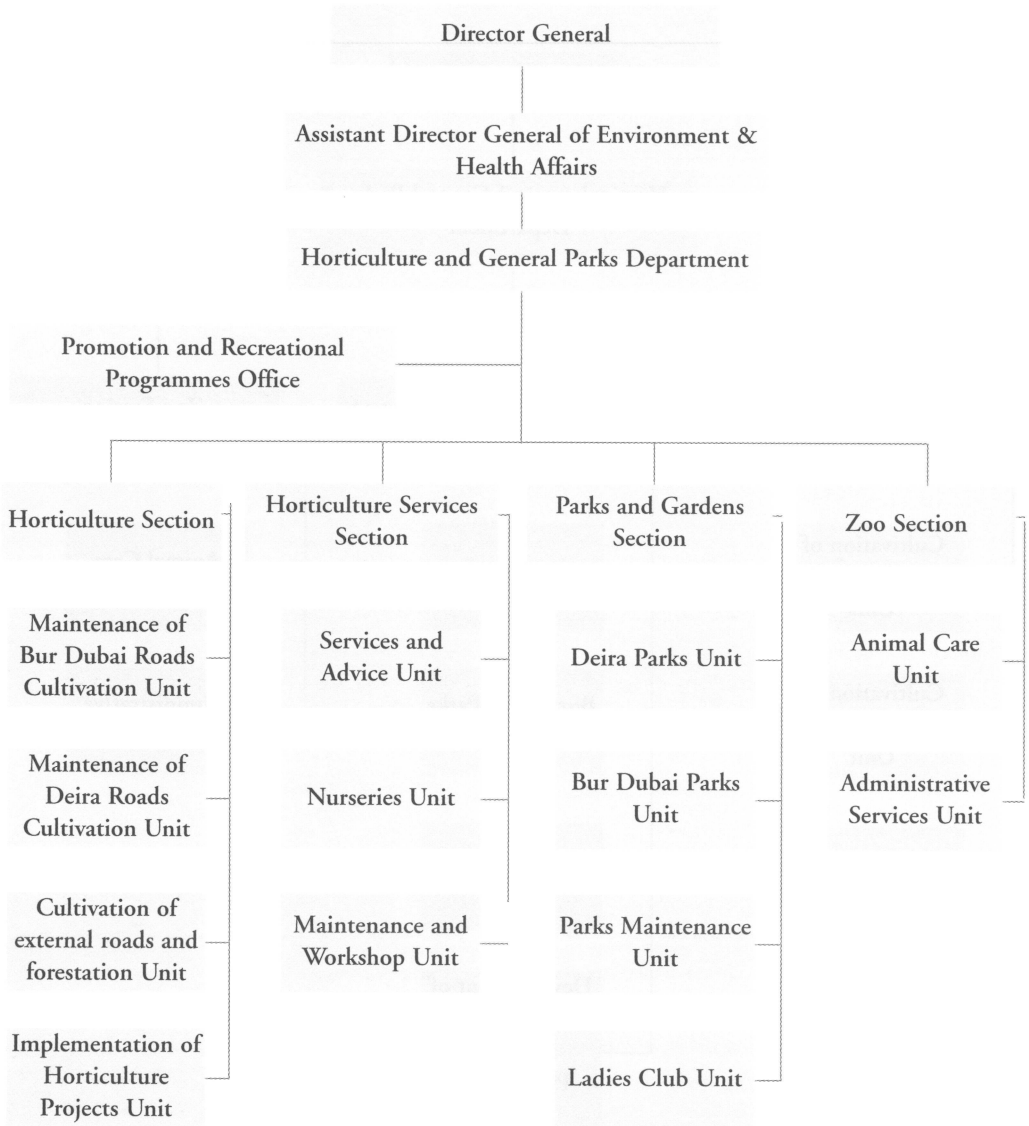
In 1993, new Units were added, and the organisation chart was revised, as shown in Chart No. 4.

## Chart No. 4. Horticulture and General Parks Department in 1993



A further amendment to the Organisation Chart took place in 1997, with the addition of new units, as shown in Chart No. 5.

## Chart No. 5. Horticulture and General Parks Department in 1997




In 1998, the Department's title was changed to the Public Parks and Horticulture Department.

In 2000, the Children's City was built in Dubai and was added as a separate Unit to the General Parks Section while in May 2002 the Ladies Club was made independent and was removed from the Section.

## The main duties of the Public Parks and Horticulture Department:

The Public Parks and Horticulture Department is responsible for planning, planting, developing, operating and maintaining gardens, general parks, public parks, Children's City, recreational services and the Zoo. The responsibilities of the various sections and Unit are as follows.

### Promotion and Recreational Programmes Office

This is responsible for promoting use of the public parks, the Children's City and the Zoo, through advertising, and through organisation of recreational events with the private sector. It also organises various events related to the department, and ensures that the necessary services are available for the public in all of these locations.

### Horticulture Section

The Horticulture Section is responsible for all of the gardens programme in the Emirate and for tree-planting. It undertakes planting of areas which were formerly cultivated as well as tree plantations and nature reserves, making use of native tree species.

### Horticulture Services Section

This Section propagates and raises the plants used in the gardens programme and provides the necessary top-soil and fertilisers, it also undertakes pest control and maintains horticultural tools and equipment and provides carpentry, welding and construction services for landscaping. it is also responsible for licensing and monitoring the work of horticultural companies in Dubai.

### Parks and Gardens Section

The Parks and Gardens Section is in charge of administering, developing, operating and maintaining the parks and their recreational services, as well as of Children's City. Its duties with regards to the recreational services, such as children's play areas, include responsibility for health and safety and for ensuring that the facilities are used in an orderly manner.

## Landscaping in Dubai

During the 1970s, tree-planting in Dubai was carried out in a somewhat erratic and unplanned way. In 1982, however, a new and scientifically-planned approach was adopted. This included:

1– Working with the Municipality Planning Section to prepare designs for new planting projects.
2– The careful selection of plants that were well-adapted for survival in the local environment.
3– Improvement of soil quality.

4– Upgrading of irrigation systems.
5– The introduction of new horticultural techniques.

By the end of the 1980s, the section had succeeded in transforming tree-planting and horticulture throughout the Emirate.

In 1987, following the decision to create the Horticulture Section, as well as the increased amount of treated wastewater available for irrigation, it was decided to establish a permanent committee to oversee plans to expand the amount of greenery throughout the Emirate. The committee was headed by the Director General with the head of the Planning Section, the head of the Drainage and Irrigation Section and the head of the Horticulture Section as members.

The committee drew up a plan to have a total of eight per cent of the urban areas of the emirate planted with trees, flowering plants, shrubs and grass.

Its tasks also included the studying of new planting projects, to choose designs and planting plans that were best suited to local conditions and would also improve the appearance of the streets and roads of Dubai, planning for the introduction of automatic irrigation systems in parks and gardens, to replace the manual watering that that previously been undertaken, the upgrading of existing gardens and parks and the approving of an annual plan for landscaping projects.

It was also charged with overseeing the appropriate horticultural research to select suitable plants and the development of links with local and foreign organisations in the field of horticulture and afforestation.

As part of this process, a research unit was set up as part of the Nurseries Section and a fully-equipped laboratory was established at the Al-Garhoud Nursery.

The Nursery was upgraded to become the first proper nursery in the UAE and the Gulf. Besides a building for the administration of the Nursery section, it was also provided with an air-conditioned greenhouse with an area of 1500 sq. metres, shaded areas, a workshop and stores. This helped the Section to attain self-sufficiency in terms of producing plants and saplings.

A programme was also put in place for the training and recruiting of personnel with the appropriate Bachelors and Masters degrees and with suitable work experience.

In order to ensure that the work of the Section was carried out in accordance with the best international practices, an arrangement was made with the United Nations Development Programme during 1988-1990 for the provision of the services of a qualified agronomist for periods of one to two months a year.

All of this planning yielded useful results.

Several major parks were established, including Al-Wasl Park in 1987, Al-Hamriyyah Park and Al-Rashidiya Park in 1988 and the Jumeirah Beach Park in 1989, while there was also a major programme of landscaping along the roads within the city as well as of the road from Dubai to Al Ain, this being carried out in three phases, in 1990, 1992 and 1997.

Automated irrigation systems were also installed in many areas, covering 31.4 per cent of the total planted area along the roads, 69 per cent of the roundabout and 87.5 per cent of the area of the parks.

As a result, it was possible for the Horticulture Section to reduce its labour force, since less

manual labourers were required for watering. The automated watering system also reduced water consumption, since it could be set to deliver only the amount of water actually required.

Further parks were established in the 1990s, including Al-Khor Park, covering 96 hectares, and Al-Mamzar Park, covering 99 hectares, both of these being completed in 1994.

In terms of afforestation and tree plantations, the Al-Qusais plantation was planted in 1991, the Mushrif plantation, covering 400 hectares, in 1992 and the Al-Rashidiya Hills plantation in 1997. In some cases, fruit trees were planted at part of the projects, although care was also taken

| Period | Number of Projects | Grass Area* | Ground Covered* | Flowers* | Palm Trees ** | Other Trees ** |
|---|---|---|---|---|---|---|
| 1981-1985 | 48 | 390,095 | - | - | 1,785 | 552,889 |
| 1986-1990 | 84 | 394,063 | 129,585 | - | 5,207 | 683,440 |
| 1991-1995 | 126 | 935,696 | 295,930 | 52,608 | 8,175 | 432,410 |
| 1996-2000 | 201 | 1,326,653 | 318,382 | 110,147 | 5,477 | 159,890 |
| 2001-2005 | 182 | 1,448,657 | 174,834 | 209,306 | 6,253 | 167,940 |
| TOTAL | 641 | 4,495,164 | 918,731 | 372,061 | 26,897 | 1,996,569 |

* Square Metre ** Number

Local production of seeds and saplings

to preserve existing native species such as Ghaf trees.

In 1995, Dubai was awarded the City Plantation Award of the Arab Towns' Organisation – the first year that this award was given.

By 2002, automated irrigation systems had been installed in all of the parks, in the Mushrif and Al-Rashidiya tree plantations and along the roads outside the city. 99 per cent of the city roads were also covered, as well as 2000 trees, of about half the total amount, in the Al-Qusais plantation.

Between 1981 and 2002, a total of 521 landscaping projects were completed, covering urban roads, private and public parks, public squares, tree plantations and nature reserves. The following table gives summary details of the projects completed as well as those due to be completed up to the end of 2005.

In 1999, the Department introduced the laying of turf lawns, making use of a special machine, ten of which are now in operation. Turves of 60 cm by 150 cm are prepared in advance and then laid, following which fertiliser is applied and the area is rolled, producing a ready-made, mature lawn.

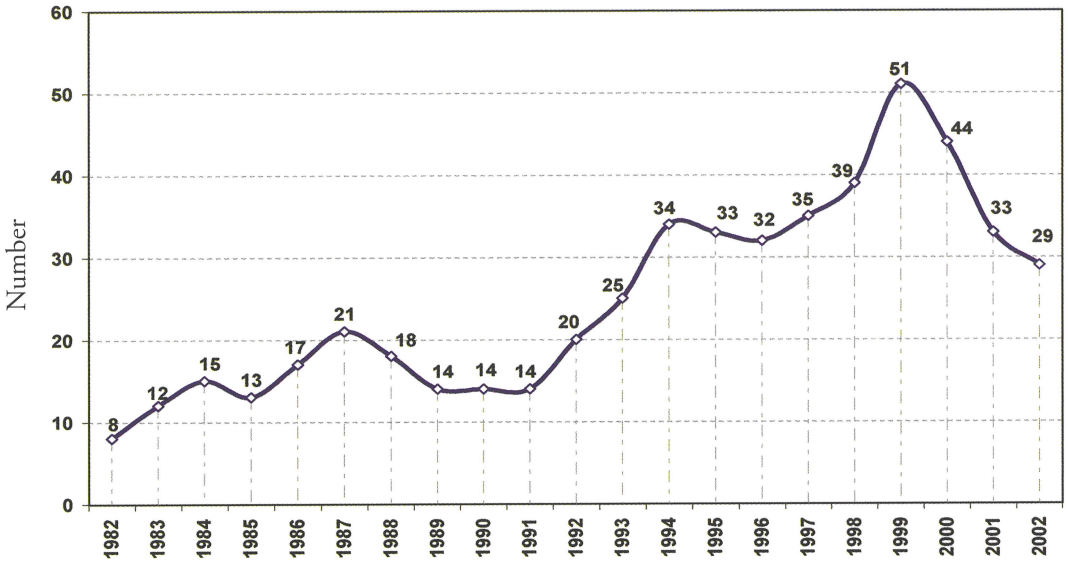
Lawns of this type were laid at Al-Saif Street, where the 2000 Dubai Shopping Festival was launched, at Gateway No. 4 to the Creek Park and outside the main entrance of the Creek Park, following the completion of the bridge linking the former site of Global Village to the Park, since the original planted area had been destroyed during the construction work. This last pro-

## Number of horticultural projects, 1982 – 2002

| No. | Year | Number of Projects completed |
|---|---|---|
| 1 | 1982 | 8 |
| 2 | 1983 | 12 |
| 3 | 1984 | 15 |
| 4 | 1985 | 13 |
| 5 | 1986 | 17 |
| 6 | 1987 | 21 |
| 7 | 1988 | 18 |
| 8 | 1989 | 14 |
| 9 | 1990 | 14 |
| 10 | 1991 | 14 |
| 11 | 1992 | 20 |
| 12 | 1993 | 25 |
| 13 | 1994 | 34 |
| 14 | 1995 | 33 |
| 15 | 1996 | 32 |
| 16 | 1997 | 35 |
| 17 | 1998 | 39 |
| 18 | 1999 | 51 |
| 19 | 2000 | 44 |
| 20 | 2001 | 33 |
| 21 | 2002 | 29 |
| TOTAL | | 521 |

ject was completed in three days – but the resulting lawn looked as though it had been established for years.

Overall, the amount of planted areas in Dubai increased from 620,367 sq. metres in 1981 to around 4 million sq. metres in 2002, the number of trees planted rose from 423,886 to 2,287,562 and the number of palm trees, counted separately, rose over the same period from 4,184 to 27,988. The following tables provide statistical data on this expansion.




Laying a turf lawn

## Growth of planted areas, 1981 – 2002

| Years | Green Areas (in square metres) | | | | Number of Trees | | Fences (metres) |
|---|---|---|---|---|---|---|---|
| | Grassed Area | Ground Cover | Flowering plants | Total | Palm Trees | Trees & Shrubs | |
| 1981 | 620,367 | - | - | 620,367 | - | 423,886 | - |
| 1982 | 786,017 | - | - | 786,017 | - | 568,486 | - |
| 1983 | 856,412 | - | - | 856,412 | 4,184 | 672,927 | - |
| 1984 | 936,912 | - | - | 936,912 | 5,397 | 781,527 | - |
| 1985 | 985,462 | - | - | 985,462 | 5,969 | 926,775 | - |
| 1986 | 1,120,928 | 7,763 | - | 1,128,691 | 6,637 | 1,053,495 | - |
| 1987 | 1,162,497 | 43,779 | - | 1,206,276 | 7,583 | 1,175,494 | - |
| 1988 | 1,254,745 | 83,766 | - | 1,338,511 | 8,696 | 1,353,322 | - |
| 1989 | 1,348,975 | 113,821 | - | 1,462,796 | 9,659 | 1,514,527 | - |
| 1990 | 1,379,525 | 129,585 | - | 1,509,110 | 11,176 | 1,610,215 | - |
| 1991 | 1,397,150 | 151,334 | 52,632 | 1,601,116 | 12,311 | 1,682,835 | - |
| 1992 | 1,499,186 | 172,094 | 56,319 | 1,727,599 | 13,202 | 1,813,561 | - |
| 1993 | 1,915,093 | 308,137 | 64,120 | 2,287,350 | 16,690 | 1,983,916 | 153,925 |
| 1994 | 2,235,409 | 372,536 | 81,837 | 2,689,782 | 17,792 | 2,024,331 | 166,849 |
| 1995 | 2,315,221 | 425,515 | 102,870 | 2,843,606 | 19,351 | 2,042,625 | 173,145 |
| 1996 | 2,502,567 | 446,488 | 109,720 | 3,058,775 | 20,517 | 2,068,373 | 174,502 |
| 1997 | 2,829,846 | 525,561 | 130,795 | 3,486,202 | 21,519 | 2,136,438 | 193,717 |
| 1998 | 3,056,191 | 600,664 | 155,595 | 3,812,450 | 23,020 | 2,159,606 | 200,121 |
| 1999 | 3,321,611 | 704,966 | 179,548.7 | 4,206,125.7 | 24,236 | 2,186,798 | 205,586.5 |
| 2000 | 3,641,874 | 743,896.7 | 213,016.7 | 4,598,787.4 | 24,828 | 2,202,515 | 207,090.25 |
| 2001 | 3,999,232 | 793,849.4 | 262,839.5 | 5,055,920.9 | 25,794 | 2,257,744 | 216,867.8 |
| 2002 | 4,190,805 | 809,866.22 | 305,132.5 | 5,305,803.73 | 27,988 | 2,287,562 | 228,315.13 |

(1) Every six ground cover plants cover an area of one square metre

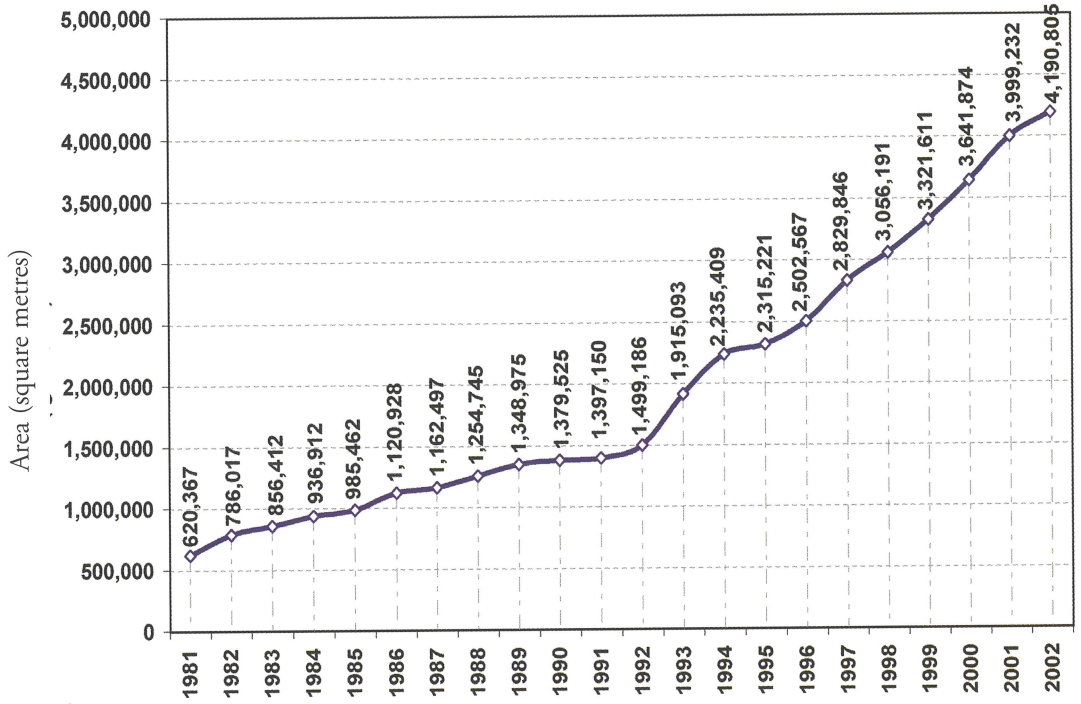
(2) Every 10 flowering plants cover an area of one square metre

• Total area planted in Dubai City in 2002 is 19,510,000 square metres

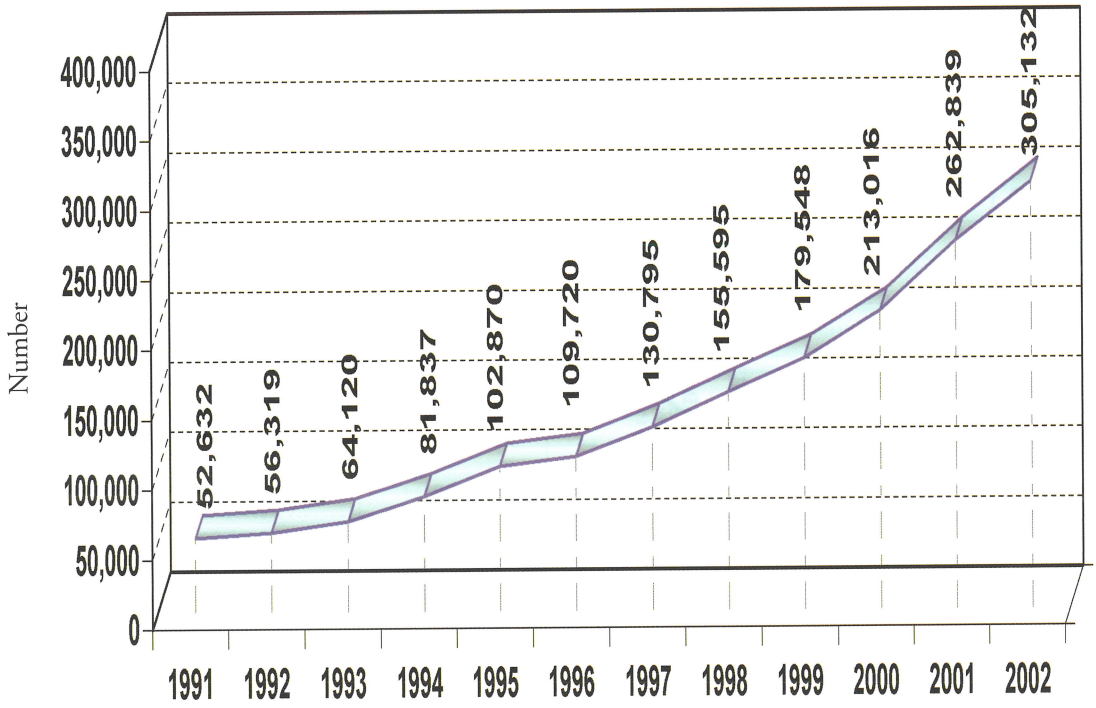
• The population of Dubai city in 2002 was 960,950 (Source: Census Centre)

• Cultivated area per capita is 19,510,000/ 960,950 = 20.3 square metres

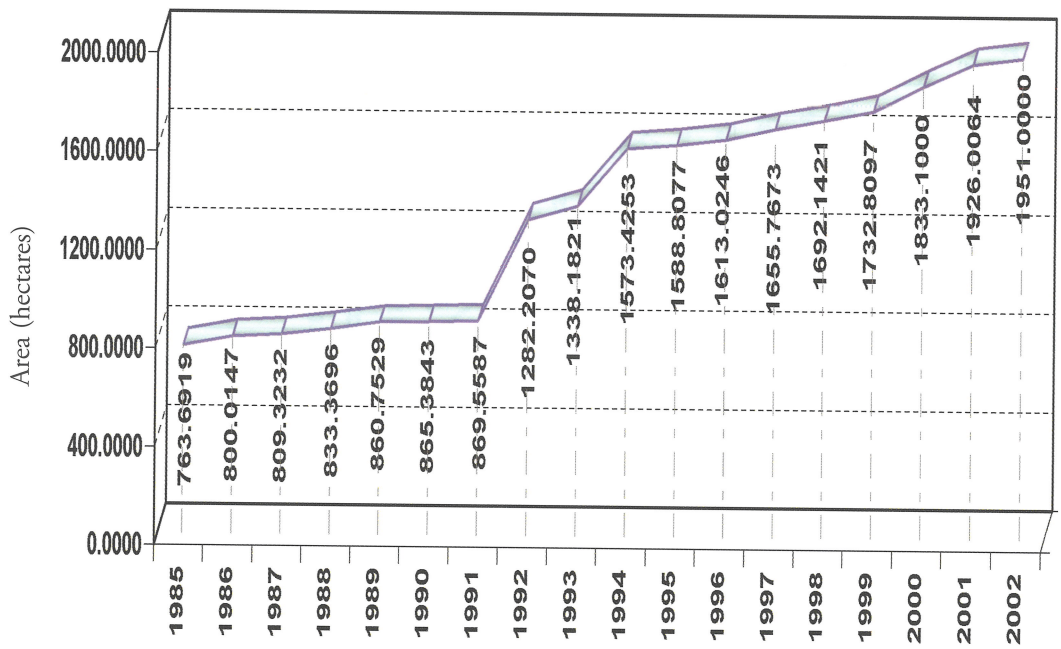
Increase in planted areas, 1981 – 2002




Flowers planted annually, 1991 – 2002



Increase in cultivated areas and annual increases between 1985 and 2002, showing progress towards the planned target of an 8 per cent total of planted land in urban areas in the Emirate of Dubai.




Creek Park

## Horticultural maintenance

Horticultural maintenance is one of the most important tasks carried out by the Department, since it is essential in order to keep the grassed areas in top condition throughout the year, even during the hot summer months.

From the time that the first Horticultural Section was established until 1997, there was a single unit in charge both of maintaining gardens and of new projects.

In that year, however, the organisation chart was amended and two separate Units were created, the Road Cultivation Unit and the Parks Unit, permitting the production of separate reports on a daily, weekly and monthly basis both on maintenance and on the progress being made on new projects.

As noted above, the organisation chart for the Public Parks and Horticulture Department was amended in 1993 with the setting up of separate Units covering Bur Dubai and Deira. Another new Unit in the Horticulture Section to handle maintenance of areas already planted, including tree plantations and roads outside the city, was also established. In the same year, a Parks Maintenance Unit was set up as part of the Parks and Gardens Section. One result of this re-organisation was the promotion of competition between the different Units, this having a positive effect on the appearance of the parks and other areas.

Using machinery to maintain grassed areas

## Introduction of modern machinery

The increasing mechanisation of horticulture in Dubai reflects the way in which the industry is developing and has also, of course, had a positive impact on labour costs. It has helped in the preparation of new areas and in the maintenance of already-established parks and gardens, while improved training and an increase in productivity has also reduced the need for labour. Between 1988 and 1989, the total workforce of labourers and gardeners fell from 1,047 to 709, a 32 per cent reduction.

Overall, the equipment introduced helped to save time and effort, allowed a reduction of manpower, and, therefore, cost, ensured that work could be completed more rapidly and also helped in the development of a preventative maintenance programme.

Over the years, the Department has worked hard to upgrade the quality of public horticulture in Dubai.

One result of this work has been a changing in the nature of planting. During the 1990s, as the expansion of parks and gardens got under way, the plants used were chosen on the basis of providing cover during winter and summer but without co-ordination in terms of the appearance of the floral displays. From 2000 onwards, however, flowering plants were chosen that, when matched, would present a co-ordinated and colourful display at selected locations. The use of other plants suitable for providing ground cover was also introduced, permitting the laying-out of displays that permitted geometric and other aesthetically-pleasing designs to be planted. Dubai was the first city in the United Arab Emirates and the Arabian Gulf to introduce plants of this kind.

Where possible, native species of plants, shrubs and trees were used for landscaping projects, such as Ghaf, Samar, Arak and Markh. These require less maintenance than introduced ornamental trees and bushes, thus reducing costs. A special booklet on the trees used for afforestation was issued in 2001.

Another major focus of the Department was a campaign to eradicate pests. This was undertaken using methods which posed no health hazards to humans and had no adverse impact on the environment. Insect light traps and pheromone traps were used to attract and trap pests while a natural pesticide derived from the seeds of the Neem tree, *Margosa* sp.was also used. The Department began in 1993 to produce its own pesticide from Neem, having considerable success in reducing numbers of Tervis worms, plant lice, spiders and nematodes. A small production plant for Neem extract was set up in 1995, at a cost of eleven thousand dirhams, while more Neem trees were planted to ensure an adequate supply of seeds.

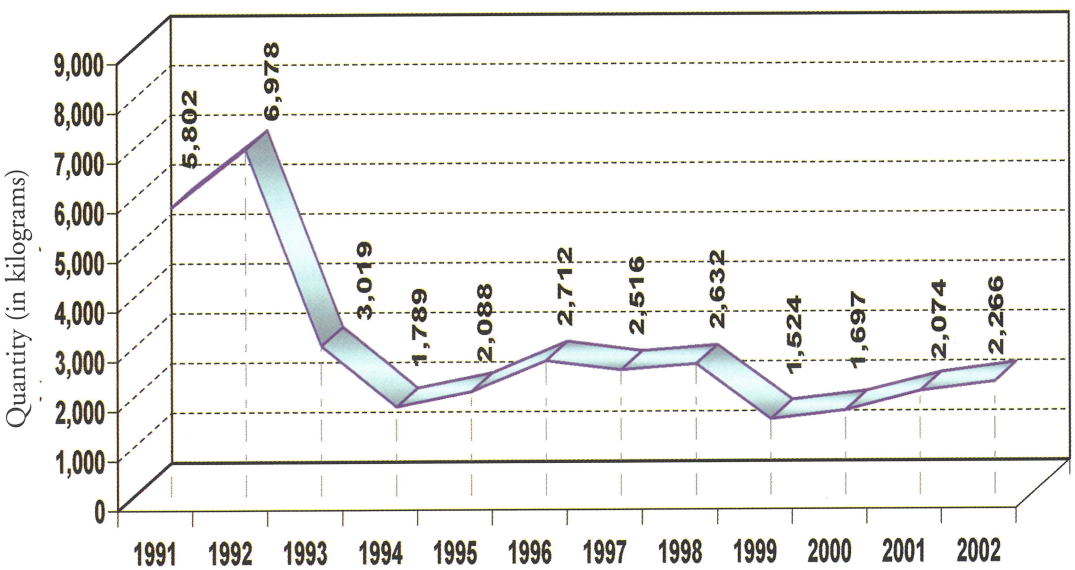
The results of this work were publicised during the 'Healthy Cities Conference' for the Arabian Gulf countries in 1995, with a leaflet being produced, in both Arabic and English, to explain the benefits of Neem-based pesticide.

This was followed by a joint project developed with the Federal Environmental Agency, FEA, on the establishment of a larger-scale plant to produce Neem extract to supply to the agricultural and horticultural sector throughout the country, as part of a drive to reduce the use of pesticides that could be harmful to people or to the environment.

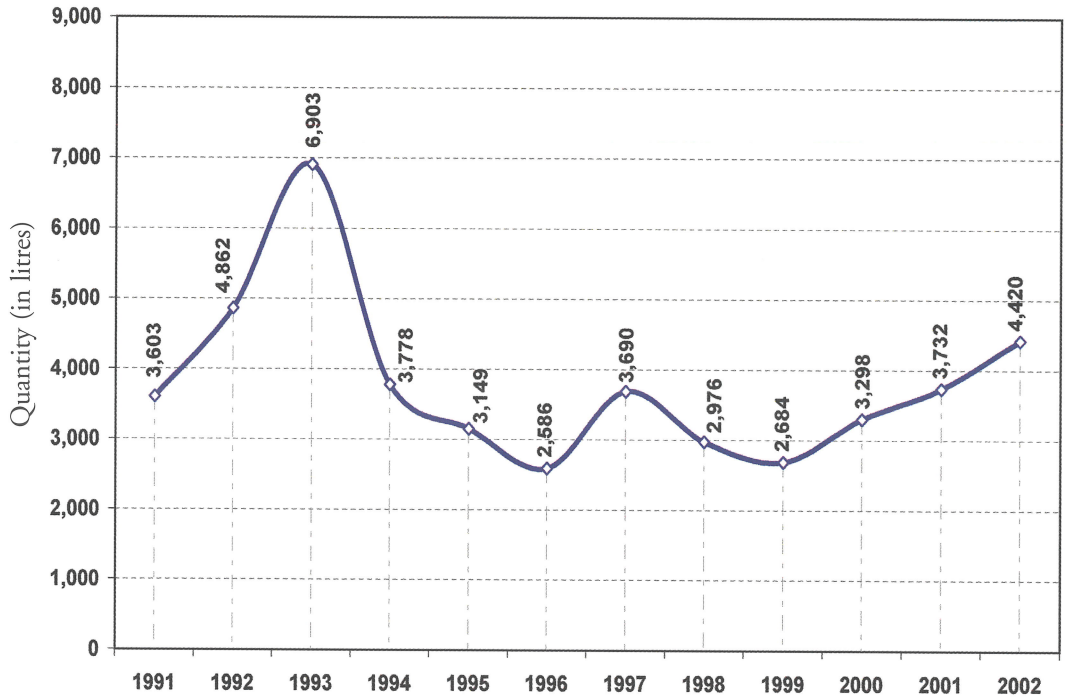
The following table gives the quantities of pesticides used against agricultural pests during the period from 1991 to 2002, illustrating the reduction in use achieved as a result of the success of the campaign, even though the area planted increased annually over the same period.

| Year | Pesticides Used | | NOTE |
|---|---|---|---|
| | Dry and Granular, in Kilograms | Liquid, in Litres | |
| 1991 | 5,802 | 3,603 | The table shows that despite the increase in the areas planted, the amount of pesticides being used has declined since 1993, owing to a well-planned campaign of pesticide application and also to the successful introduction of Neem extract. |
| 1992 | 6,978 | 4,862 | |
| 1993 | 3,019 | 6,903 | |
| 1994 | 1,789 | 3,778 | |
| 1995 | 2,088 | 3,149 | |
| 1996 | 2,712 | 2,586 | |
| 1997 | 2,516 | 3,690 | |
| 1998 | 2,632 | 2,976 | |
| 1999 | 1,524 | 2,684 | |
| 2000 | 1,697 | 3,298 | |
| 2001 | 2,074 | 3,732 | |
| 2002 | 2,266 | 4,420 | |

Quantity of dry and granular pesticides, 1991 – 2002



Quantity of liquid pesticides used, 1991 – 2002




The use of *Margosa* sp., (Neem), seeds and the financial savings are shown in this table.

| Year | Quantity of Margosa (Neem) seeds used, in kilograms | Value, in Dirhams | Notes |
|---|---|---|---|
| 1996 | 707 | 17,675 | The market price of one kilogram of Neem seeds is 25 dirhams.<br><br>The amount of money saved annually represents the use of Neem powder as a pesticide against worms, plant lice, Tervis, spiders, white fly and nematodes.<br>The powder is used at the rate of 1.5 to 2 grams per litre of water. |
| 1997 | 3,287 | 82,175 | |
| 1998 | 6,308 | 157,700 | |
| 1999 | 7,961 | 199,025 | |
| 2000 | 5,482 | 137,050 | |
| 2001 | 13,438 | 335,950 | |
| 2002 | 7,099 | 177,475 | |

A sprinkler system in operation

## Booklet on horticultural maintenance

This booklet, prepared in 1999, includes a description of how to maintain all kinds of garden plants, such as palm trees, trees, shrubs, plants for ground cover, flowers and climbing plants used on fences. It also provides advice on how to ration the use of water for irrigation and on machines used in horticulture, including routine maintenance, operating them and a guide to cost.

The booklet was distributed to Head of Units, Agronomists and Supervisors.

## Automated Irrigation

The introduction of automated irrigation techniques has speeded up the completion of new projects and has reduced the amount of time needed for irrigation, thanks to the elimination of manual watering. Labour costs have also been reduced. The first automated watering systems were introduced in 1982, and by 2001 these had been extended to all parks, gardens and others areas needing irrigation.

## Committees and Working Groups

In order to promote the development of team work and to improve performance, a number of special committees and working groups were established, as follows:

## Committees

| No. | Name of Committee | No. | Name of Committee |
|---|---|---|---|
| 1 | Agricultural Projects Committee | 3 | Agricultural Tools and Equipment Committee |
| 2 | Agricultural Research and Studies Committee | 4 | Quality and Excellence Committee |

## Working Groups

| No. | Name of Working Group | No. | Name of Working Group |
|---|---|---|---|
| 1 | Quality and Excellence | 8 | Parks Marketing and Advertising |
| 2 | Development of Computer Systems and e-Government | 9 | Coordination of Agricultural and Irrigation Works |
| 3 | Agricultural Research and Studies | 10 | Creative Thinking |
| 4 | Agricultural Design | 11 | Suggestions System |
| 5 | Equipment and Tools | 12 | Customer Satisfaction |
| 6 | Supervision of Children's City | 13 | Performance Evaluation |
| 7 | City Landscaping | | |

## Celebrations of Afforestation

Former UAE President His Highness Sheikh Zayed bin Sultan Al Nahyan was well known for his interest in afforestation, and frequently urged the various Municipalities throughout the country, as well as other bodies, to devote effort to planting more trees. He also gave instructions that an annual 'Tree Day' should be celebrated.

This later became 'Tree Week', which is marked annually under the aegis of the General Secretariat of the UAE Municipalities.

The Dubai Municipality marks the event with a series of workshops and other activities designed to promote participation by individuals, organisations, companies and schools. Tree-planting programmes are organised while trees, shrubs and flowers are distributed free to residents of the various areas of the Emirate.

During the week, staff of the Municipality also become involved in organising seminars, talk-

Al-Garhoud Nursery

ing to the media, preparing and distributing leaflets and supporting the organisation of horticultural shows.

## The role of greenhouses

Greenhouses have played an important role in the propagation and supply of saplings and seedlings used for planting programmes.

In 1982, the Municipality had only one greenhouse, at the Hor Al-Anz Nursery.

In 1989, however, a 1,500 sq. metre greenhouse was completed at the Al-Garhoud Nursery,

### Nurseries and other areas for plant propagation established between 1985 and 1997

| No. | Name of Nursery | Year of Establishment | No. | Name of Nursery | Year of Establishment |
|---|---|---|---|---|---|
| 1 | Mushrif Nursery | 1985 | 6 | Propagation plot at Al-Garhoud Nursery | 1992 |
| 2 | Nad Al-Sheba Nursery | 1986 | 7 | Al-Khor Park Nursery | 1994 |
| 3 | Zabeel Nursery | 1987 | 8 | Al-Mamzar Park Nursery | 1994 |
| 4 | Al-Garhoud Nursery | 1989 | 9 | Palm Tree propagation plot in Al Mushrif Park | 1995 |
| 5 | Al-Safa Nursery | 1992 | 10 | Al-Rodis Farm, Al-Aweer | 1997 |

along with a head office for the Horticulture Section, which moved to Al-Garhoud from the main Municipality building in 1990.

In the same year, other facilities were completed at the nursery, including a laboratory, a workshop for machines, stores for agricultural and horticultural materials, a cold store, shared areas and an open-door area for plant propagation.

By mid 1995, with the completion of a date-palm propagation plot in Mushrif Park, the department had a total of nine nurseries, while in 1997, the 80-hectare Al-Rodis Farms project in Al-Aweer was completed.

By 1995, the Department was producing around three and a half million saplings and seedlings a year.

## Dubai Municipality nurseries, 1982 – 2001

| No. | Year | Total Number | Comments |
|---|---|---|---|
| 1 | 1982 | 1 | Hor Al-Anz Nursery |
| 2 | 1984 | 2 | Al-Safa Nursery added |
| 3 | 1985 | 3 | Mushrif Park Nursery added |
| 4 | 1986 | 6 | Nad Al Sheba, Zabeel, Al-Garhoud and Al-Safa Nurseries added |
| 5 | 1994 | 8 | Al-Khor Park and Al-Mamzar Park Nursery added |
| 6 | 1997 | 6 | Hor Al-Anz Nursery becomes a park and Zabeel Nursery is grassed over |
| 7 | 2001 | 6 | Studies for a new 18-hectare nursery in the Al-Warsen area |

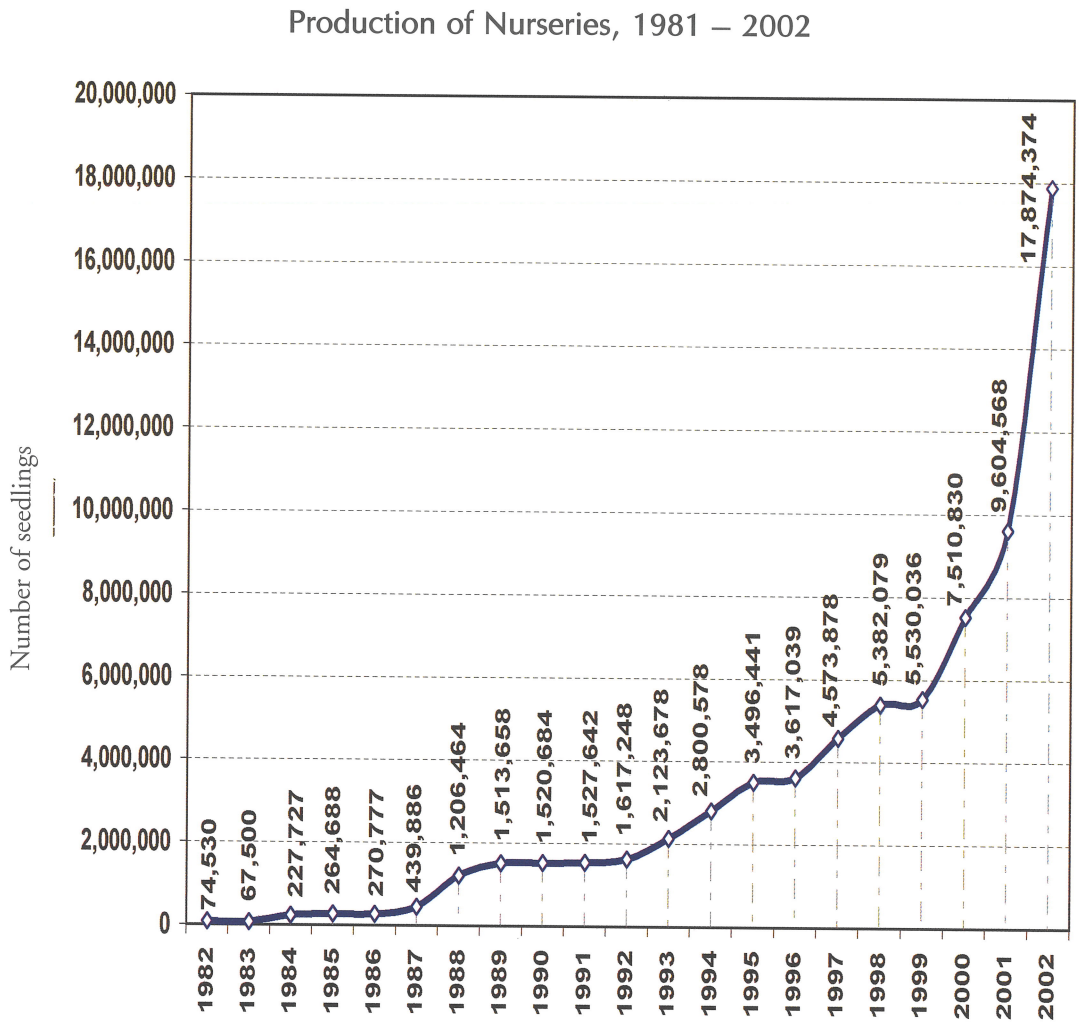
In 1997, there was a re-organisation of the nurseries. The old Hor Al-Anz nursery was transformed to become a public park while the Zabeel Nursery was turned over to grass. Despite this reduction in the area being cultivated, however, the introduction of more efficient technology meant that the number of saplings and seedlings being produced continued to rise, reaching 17, 874, 374 in the year 2002, as shown in the following table. Production is projected to continue to increase and will contribute to meeting the target of having eight per cent of the total urban area of Dubai planted in various ways.

The increase in output from the nurseries, as well as the higher quality of seedlings produced, was due to a number of factors. Of particular importance was the increased professionalism of nursery work, made possible by the setting up of a trials station for new species and varieties of plants and of a laboratory. Tissue culture propagation was also introduced, while a highly-trained horticulturalist was appointed to oversee research.

This was complemented by other innovations, such as the careful selection of the proper envi-

## Production of Nurseries, 1981 – 2002

| Year | Production/ Seedlings | Comments and annual rates of increase |
|---|---|---|
| 1981 | Nil | All requirements purchased from the market |
| 1982 | 74,530 | First year of production from the Municipality greenhouse |
| 1983 | 67,500 | Production reduced by 9.44% due to lack of space |
| 1984 | 227,727 | Production increase of 237%, due to opening of Al-Safa Nursery |
| 1985 | 264,688 | Production increase of 16.23% |
| 1986 | 270,777 | Production increase of 2.3% |
| 1987 | 439,886 | Production increase of 62.45%, as new nurseries completed, bringing total to six |
| 1988 | 1,206,464 | Production increase of174.3% due to expansion of Al-Garhoud Nursery |
| 1989 | 1,513,658 | Production increase of 25.46% due to further expansion |
| 1990 | 1,520,684 | Production increase of 0.5% |
| 1991 | 1,527,642 | Al-Safa Park Nursery suspended activity, due to a re-planning of the whole park. Total production still increased slightly. |
| 1992 | 1,617,248 | Increase of 5.8% |
| 1993 | 2,123,678 | Increase of 31.3% |
| 1994 | 2,800,578 | Increase of 31.9% |
| 1995 | 3,496,441 | Increase of 24.8% |
| 1996 | 3,617,039 | Increase of 3.4% |
| 1997 | 4,573,878 | Increase of 26.5% |
| 1998 | 5,382,079 | Increase of 17.7% |
| 1999 | 5,530,036 | Increase of 27.5% |
| 2000 | 7,510,830 | Increase of 35.8% |
| 2001 | 9,604,568 | Increase of 27.9% |
| 2002 | 17,874,374 | Increase of 86.1% |




## Horticulture Laboratory

The Laboratory was established in 1990. Besides carrying out a variety of experiments, it also seeks solutions for problems encountered in the field during work by Department staff.

Amongst its work is the testing of seeds and germination patterns, the carrying out of chemical and physical tests on soils, including their salinity, pH and nutrient and calcium carbonate and analysis of samples of irrigation water to check salinity, pH content and concentration levels of soluble chemicals. Fertilisers are analysed to measure the presence of elements such as nitrogen, phosphorus, potassium, iron, copper and cobalt and to check humidity, the percentage of organic matter and the degree of electric conductivity. Plant samples are checked to measure the content of nutritious elements and chlorophyll.

Other duties include the preparation of special solutions for nurseries and inspections, by microscope, for diseases.

ronments for propagation and early stages of growth, sterilisation of cuttings, using growth regulators, providing effective fertilisation by supplying soluble fertilisers through tanks connected to the irrigation network in greenhouses, plant propagation plots and shaded areas and the provision of automated irrigation in the shaded areas of the Al-Garhoud and Nad Al-Sheba Nurseries.

The introduction of machinery to move plants around, rather than wheelbarrows, helped to protect the young plants, while modern machinery was also introduced for the packaging and bagging of plants.

A number of these innovations also proved to have a beneficial impact on costs, since increased mechanisation made it possible to reduce the amount of manpower required.

## Introduction of new species

An important part of the work of the Horticulture Section has been the identification of species and varieties of plants which are suited to local conditions, so as to build up a database that would permit a wide range of plants to be used, thus varying the appearance of parks, gardens and other planted areas.

Plants identified as being suitable were kept as stock in the Al-Garhoud Nursery, so that they could be used for propagation, as and when required.

The increase in the number of nurseries made it easier to introduce new species and varieties while use of the latest propagation techniques helped to ensure that the required number of seedlings and cutting could be produced. In all, a total of 650 new species and varieties were introduced.

The annual horticultural shows in Dubai, in which other Municipalities as well as private companies also take part, also provides staff of the Horticultural Section with an opportunity to evaluate other plants that may be suitable for use.

The Nursery Unit was an important part of the Horticulture Section from the time that it was established.

In 1997, a restructuring of the Section saw it being divided into two, the Horticulture Section and the Horticultural Services Section and the Nursery Unit was placed in the Horticultural Services Section, as shown in the organisation chart for 1997 (above).

In 2001, studies began for the setting up of a modern nursery in the Al-Warsen area, near the sewage treatment plant. This was to include offices for the Unit, a showroom for the sale of plants, greenhouses, shaded areas, areas for propagation of seedlings and raising them, a soil and water laboratory, a tissue propagation laboratory, a workshop and cold stores.

Over the years, particularly since the establishment of its plant propagation and cultivation plots, the Al-Garhoud Nursery has become a popular place to visit for university and school students, with students at the Agriculture College at the Emirates University having gained particular benefit. Besides organising scientific fieldtrips, nursery staff have also run training courses for students studying agriculture production, landscaping and plant protection.

In December 1996, visiting scientists attended a conference on mangroves at the Emirates University made a special trip to the Nursery to look at its cultivation of young mangroves.

## Plant species and varieties introduced, 1986 – 2002

| Item | Year | Number of new species and varieties |
|---|---|---|
| 1 | 1986 | 21 |
| 2 | 1989 | 57 |
| 3 | 1991 | 110 |
| 4 | 1992 | 34 |
| 5 | 1995 | 102 |
| 6 | 1996 | 119 |
| 7 | 1997 | 23 |
| 8 | 1999 | 41 |
| 9 | 2000 | 162 |
| 10 | 2001 | 201 |
| 11 | 2002 | 217 |
| TOTAL | | 1,087 |

The Horticulture Laboratory

## Tissue Propagation Laboratory

Tissue propagation is used in the nurseries with the objective of producing large numbers of plants with identical genes similar to the mother plant. Initially, a small laboratory was built in Mushrif Park Nursery in order to produce superior palm tree varieties, until the main Tissue Propagation Laboratory is completed as part of the new Municipality Nursery project in the Al-Warsen area. The production cycle lasts for five years starting from the planting of plant tissues in the laboratory until the seedlings are ready to plant.

## Agricultural Services offered to the Public

Since 1976, Dubai Municipality has provided horticultural services to the public in order to encourage them to take an interest in planting and to take part in increasing the planted areas in the Emirate. The following table on page 552, illustrates the services provided to the public by the Horticulture Section and Horticulture Services Section during the period 1981 – 2002. Data for the period from 1976 – 1980 is not available.

### The Laboratory's equipment at the end of 2002

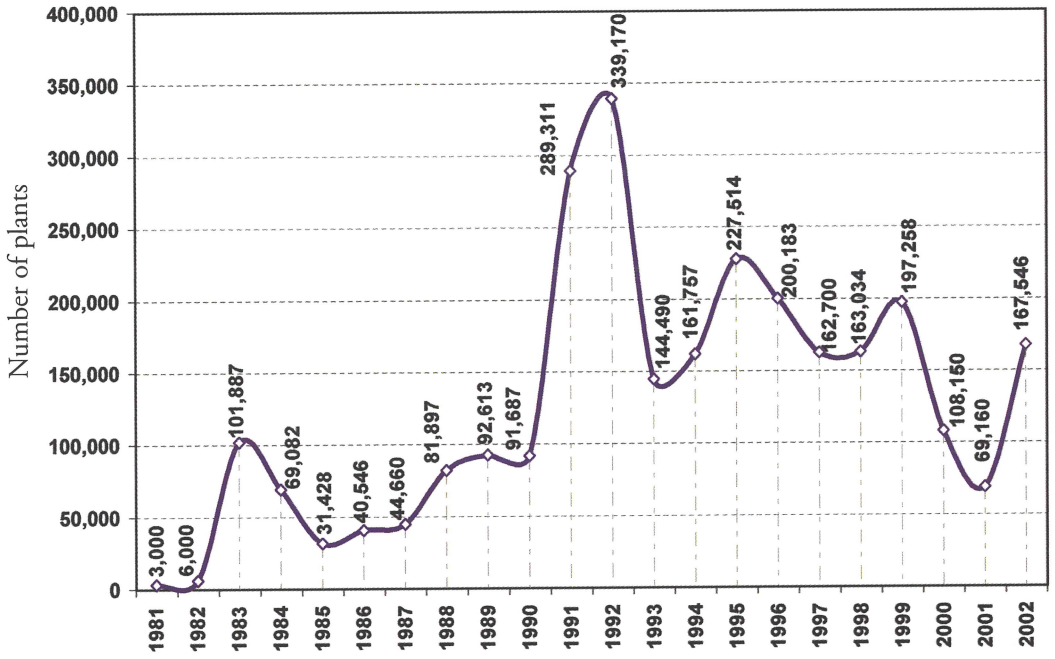
| Item | Equipment and functions |
|---|---|
| 1 | Seed Germination Apparatus |
| 2 | Growth Chamber |
| 3 | Incinerator |
| 4 | Oven |
| 5 | Digestion Apparatus |
| 6 | Apparatus to measure elements of nutrition |
| 7 | Shaking Apparatus |
| 8 | Filtration Apparatus |
| 9 | pH Measuring Apparatus |
| 10 | Salinity Measuring |
| 11 | Water Bath Apparatus |
| 12 | Microscope |
| 13 | Programmed Apparatus to measure percentage of Seed Germination |
| 14 | Centrifuge |
| 15 | Magnetic Movement Apparatus |
| 16 | Filtration Apparatus |
| 17 | Gas Centrifuge |
| 18 | Scales |
| 19 | Grinder |
| 20 | Spectral Absorption Apparatus |
| 21 | Measurement of calcium carbonate |
| 22 | Measurement of Nitrogen |
| 23 | Atomic Absorption Apparatus |
| 24 | Ionisation Analysis |
| 25 | Preparation of saturated soil paste |

## Services provided to the public, 1981 – 2002

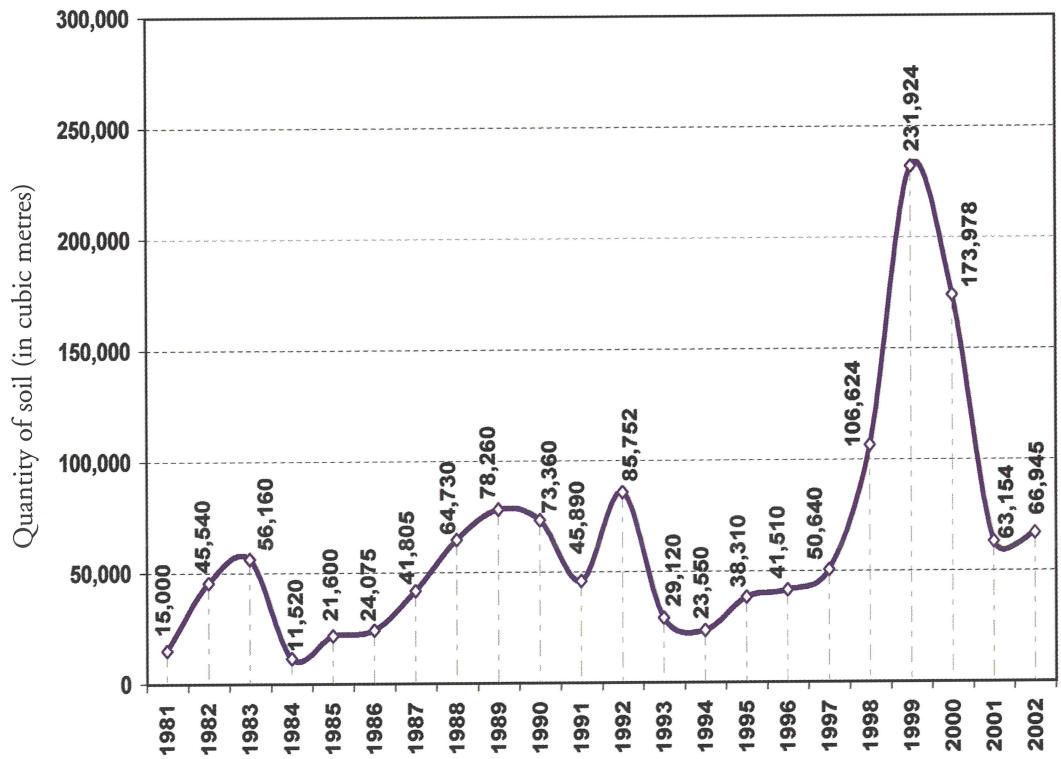
| No. | Year | Number of Plants | Agricultural soil in Cubic Metres* |
|---|---|---|---|
| 1 | 1981 | 3,000 | 15,000 |
| 2 | 1982 | 6,000 | 45,540 |
| 3 | 1983 | 101,887 | 56,160 |
| 4 | 1984 | 69,082 | 11,520 |
| 5 | 1985 | 31,428 | 21,600 |
| 6 | 1986 | 40,456 | 24,075 |
| 7 | 1987 | 44,660 | 41,805 |
| 8 | 1988 | 81,897 | 64,730 |
| 9 | 1989 | 92,613 | 78,260 |
| 10 | 1990 | 91,687 | 73,360 |
| 11 | 1991 | 289,311 | 45,890 |
| 12 | 1992 | 339,170 | 85,752 |
| 13 | 1993 | 144,490 | 29,120 |
| 14 | 1994 | 161,757 | 23,550 |
| 15 | 1995 | 227,514 | 38,310 |
| 16 | 1996 | 200,183 | 41,510 |
| 17 | 1997 | 162,700 | 50,640 |
| 18 | 1998 | 163,034 | 106,624 |
| 19 | 1999 | 197,258 | 231,924 |
| 20 | 2000 | 108,150 | 173,978 |
| 21 | 2001 | 69,160 | 63,154 |
| 22 | 2002 | 167,546 | 66,945 |
| TOTAL | | 2,793,073 | 1,389,447 |

* During the period 1976-1981, agricultural soil and seedlings were provided according to availability .

Plants supplied to the public, 1981 – 2002




Agricultural soil provided to the public, 1981 – 2002



## Agricultural soil transported from Al-Khawaneej area, 1988 – 2002, in cubic metres

| Year | By the Section | | By private companies, in cu. m | TOTAL in cu. m |
|---|---|---|---|---|
| | Section in cu. m | Assistance in cu. m | | |
| 1988 | 36,950 | 64,730 | 86,270 | 187,950 |
| 1989 | 62,350 | 78,260 | 56,210 | 196,820 |
| 1990 | 58,270 | 73,360 | 43,950 | 175,580 |
| 1991 | 65,730 | 45,890 | 248,472 | 360,092 |
| 1992 | 47,736 | 85,752 | 386,834 | 520,322 |
| 1993 | 40,940 | 29,120 | 143,280 | 213,340 |
| 1994 | 85,840 | 23,550 | 140,850 | 250,240 |
| 1995 | 74,490 | 38,310 | 245,140 | 357,940 |
| 1996 | 52,650 | 41,510 | 343,420 | 437,580 |
| 1997 | 25,780 | 50,640 | 608,300 | 684,720 |
| 1998 | 36,260 | 106,624 | 331,324 | 474,208 |
| 1999* | 30,394 | 231,924 | 382,046 | 644,364 |
| 2000 | 37,632 | 173,978 | 356,257 | 567,867 |
| 2001 | 40,502 | 63,154 | 421,760 | 525,416 |
| 2002 | 79,830 | 66,945 | 391,752 | 538,527 |
| TOTAL | 775,354 | 1,173,747 | 4,185,865 | 6,134,966 |

* From 1999, the Environment Department was in charge of the transportation of soil for agricultural use.

## Number of trees planted in residential areas

| Item | Area | Number of Trees | Types of tree planted |
|---|---|---|---|
| 1 | Al-Rashidiya | 2,447 | Ghaf, *Margosa* (Neem) and Ficus |
| 2 | Al-Tawar | 425 | *Margosa* (Neem) |
| 3 | Al-Mamzar | 125 | *Margosa* (Neem) |
| 4 | Al-Jafliya | 120 | *Margosa* (Neem) |
| | TOTAL | 3,117 | |

| No. | Name of Booklet | Language | No. | Name of Book | Language |
|---|---|---|---|---|---|
| 1 | Mushrif Park | Ar. - Eng. | 1 | Dubai Parks | Ar. - Eng. |
| 2 | Al-Mamzar Park | Ar. - Eng. | 2 | Wild Cats in the Emirates | Ar. - Eng. |
| 3 | Al-Safa Park | Ar. - Eng. | 3 | Local Trees in the United Arab Emirates | Ar. - Eng. |
| 4 | Jumeirah Beach Park | Ar. - Eng. | 4 | Grass areas | Arabic |
| 5 | Al-Khor Park | Ar. - Eng. | 5 | Local Plants used in afforestation | Arabic |
| 6 | Dubai Ladies Club | Ar. - Eng. | 6 | Public Service Manual (prices of plants in the nurseries) | Arabic |
| 7 | Jet Skies | Ar. - Eng. | 7 | New decorative plants for landscaping projects | Arabic |
| 8 | Safety Manual for Visitors to the Beach | Ar. - Eng. | 8 | Children's City | Ar. - Eng. |
| 9 | Animal Colouring Booklet | Ar. - Eng. | | | |
| 10 | Zoo Animals Guide | Ar. - Eng. | | | |
| 11 | Miniature map of the Zoo | Ar. - Eng. | | | |

## Provision of Guidance

The guidance programme is intended to transfer knowledge of landscaping and gardening to the public living in the city as well as to farmers, of all nationalities, educational levels and age groups, so that they can use the knowledge in their gardens and farms. It also helps to encourage people to take care of public gardens.

The programme also provides a way in which staff of the Section can transfer their own experience to the public at large, and helps in promoting a greater awareness of the importance of parks, gardens and other open green spaces in terms of public health and protection of the environment.

The Section has made good use of the media to spread information and gives away plants to the public to encourage their participation in the general programming of trying to increase greenery in Dubai.

Another focus of activities has been involvement with schools. The Section has helped a number of schools to cultivate their own gardens and has carried out various other activities to introduce students to gardening. Schools have also been invited regularly to take part in the 'Tree Week' celebrations held over the course of the last 21 years.

Since 1987, the Section has issued 12 guidance leaflets, 11 booklets and 8 books, as shown in the following table.

## Guidance Leaflets

| Item | Name of Leaflet | Language |
|---|---|---|
| 1 | Fruit Fly | Arabic & English |
| 2 | Nematoda | Arabic |
| 3 | Annual and Perennial Flowers | Arabic & English |
| 4 | Maintenance of grass areas | Arabic & English |
| 5 | Indoor Plants | Arabic & English |
| 6 | Chrysanthemums | Arabic & English |
| 7 | Carnations | Arabic |
| 8 | Diseases and pests affecting grass areas | Arabic & English |
| 9 | Comprehensive eradication of horticultural pests | Arabic |
| 10 | Bougainvillea | Arabic |
| 11 | *Margosa* (Neem) Tree | Arabic |
| 12 | Citrus Leaves Tunnel Worms | Arabic & English |

## Development of Manpower

During the 1970s, the manpower used for horticulture was untrained and lacking in experience. From the beginning of the major planting campaign in 1982, however, the Section set out to attract new employees with both scientific training and practical experience.

For the first decade, the focus was on people with experience in planting orchards and decorative plants, and with a knowledge of safety procedures. Three of the newly-recruited employees were agronomists with Master's degrees and with practical experience who had previously held supervisory posts. All Agronomist posts were filled by people with experience in orchards or in agriculture. A special programme was devised to attract UAE citizens.

An extensive series of training courses for supervisors and gardeners was begun. Two month-long courses were held in 1989 and 1991 for supervisors and another, two-week, course for gardeners in 1989 while other courses were also held for engineers and for Unit Heads.

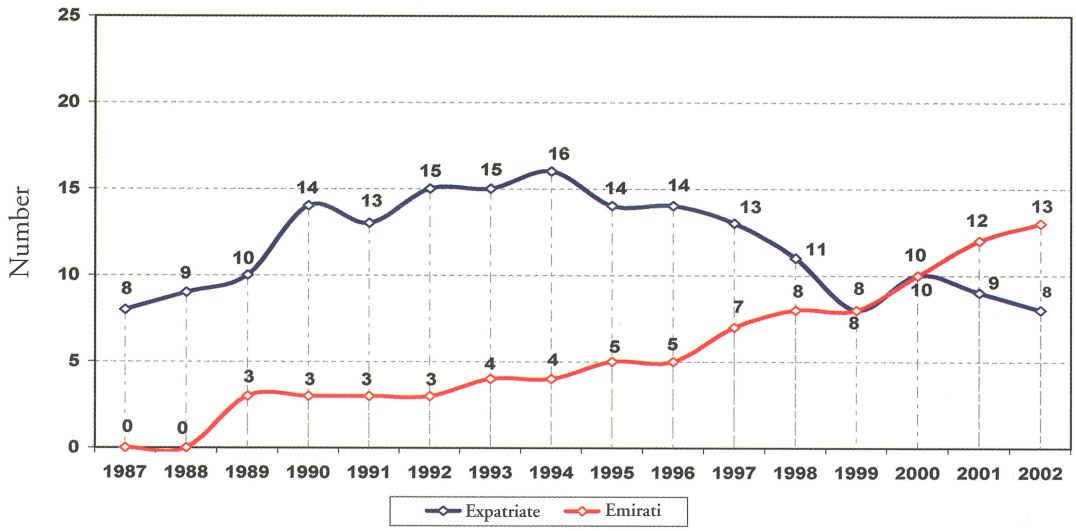
Seven graduates from the Agricultural College of the Emirates University were recruited, one eventually becoming the Head of the Section with the others holding posts of Heads of Unit and Agronomists. When recruited, these were given good training and their work was continually monitored, to encourage them to refine their skills. A process of over-rapid promotion was avoided.

Training Course for Agriculture Graduates

## Number of Agronomists in the Public Parks and Horticulture Department, 1987 – 2002

| Year | Number of Agronomists | | | | Comments |
|---|---|---|---|---|---|
| | Expatriate | Emirati | Total | Percentage of UAE citizens | |
| 1987 | 8 | - | 8 | 0% | The increase in the level of Emiratisation, even though most posts require specialist training, shows the success of the programme. Section and Unit Head posts are only open to trained personnel. |
| 1988 | 9 | - | 9 | 0% | |
| 1989 | 10 | 3 | 13 | 23% | |
| 1990 | 14 | 3 | 17 | 17.6% | |
| 1991 | 13 | 3 | 16 | 18.7% | |
| 1992 | 15 | 3 | 18 | 16.6% | |
| 1993 | 15 | 4 | 19 | 21% | |
| 1994 | 16 | 4 | 20 | 20% | |
| 1995 | 14 | 5 | 19 | 26.3% | |
| 1996 | 14 | 5 | 19 | 26.3% | |
| 1997 | 13 | 7 | 20 | 35% | |
| 1998 | 11 | 8 | 19 | 42% | |
| 1999 | 8 | 8 | 16 | 50% | |
| 2000 | 10 | 10 | 20 | 50% | |
| 2001 | 9 | 12 | 21 | 57% | |
| 2002 | 8 | 13 | 21 | 62% | |

## Number of Agronomists, 1987 – 2002

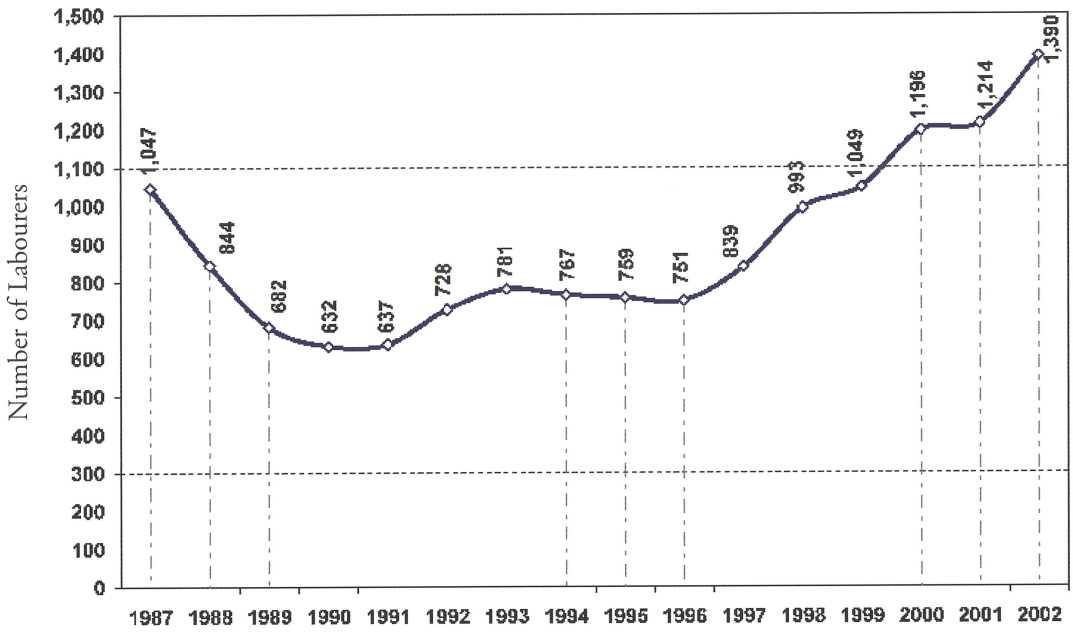



Following the introduction of an automated irrigation system, in the streets and parks of Dubai and the use of modern horticultural machinery, the Department was able to reduce the number of manual labourers from 1,047 in 1987 to 637 in 1991, a reduction of 39.2 per cent. This took place despite the rapid increase in the cultivated area over the same period, with the number of trees and shrubs increasing by 43 per cent, areas under grass by 20 per cent and the number of ground cover plants that had been planted by 245 per cent.

## Manual labourers employed, 1987 – 2002

| Year | Number of Labourers | Percentage of reduction compared to base year | Comments |
|---|---|---|---|
| 1987 | 1,047 | — | During this period the cultivated areas increased by 416.6%, palm trees increased by 274.4% and trees and shrubs increased by 192.1%. |
| 1988 | 844 | 19.4% | |
| 1989 | 682 | 34.9% | |
| 1990 | 632 | 39.6% | |
| 1991 | 637 | 38.2% | |
| 1992 | 728 | 30.5% | |
| 1993 | 781 | 25.4% | |
| 1994 | 767 | 26.7% | |
| 1995 | 759 | 27.5% | |
| 1996 | 751 | 28.3% | |
| 1997 | 839 | 19.9% | |
| 1998 | 993 | 5.2% | |
| 1999 | 1,049 | Increase of 0.2% | |
| 2000 | 1,196 | Increase of 14.2% | |
| 2001 | 1,214 | Increase of 16% | |
| 2002 | 1,390 | Increase of 14.5% | |

## Manual Labourers employed, 1987 – 2002




This allowed the Section to make older manual labourers redundant, helping to increase productivity and, thence, the costs of maintenance.

Salaries and benefits paid by the Section fell from 17,017,822 dirhams in 1987 to 14,396,049 dirhams in 1990 despite the fact that in 1990 salaries were increased for employees in the Department and they were also provided with a housing allowance, at a rate of 60% of their basic salary as well as a transport allowance.

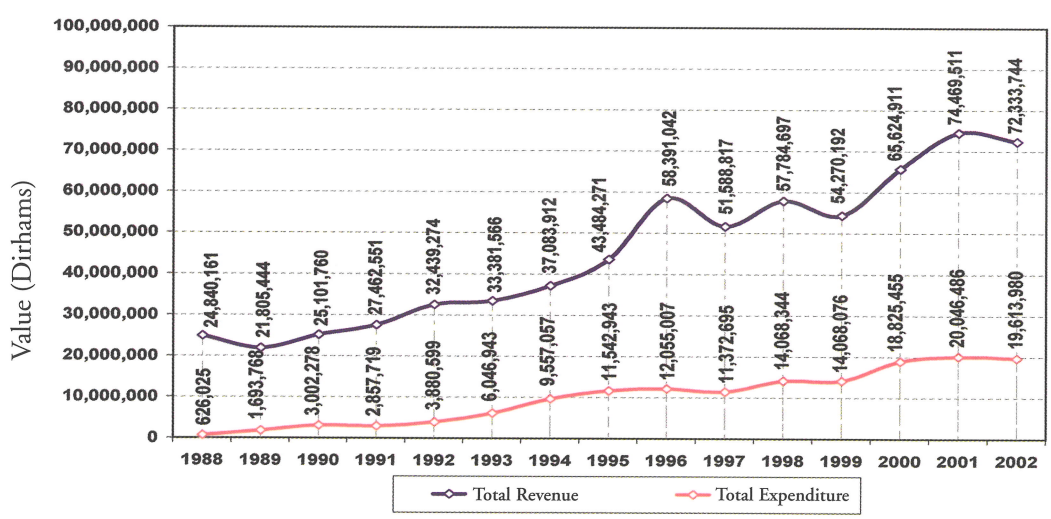
## Vehicles and machinery in the Public Parks and Horticulture Department, 1992 – 2002

| Item | Year | Number of Vehicles and other Machinery | Item | Year | Number of Vehicles and other Machinery |
|---|---|---|---|---|---|
| 1 | 1992 | 29 | 7 | 1998 | 158 |
| 2 | 1993 | 31 | 8 | 1999 | 187 |
| 3 | 1994 | 50 | 9 | 2000 | 194 |
| 4 | 1995 | 63 | 10 | 2001 | 222 |
| 5 | 1996 | 89 | 11 | 2002 | 236 |
| 6 | 1997 | 127 | | | |

## Public Parks and Horticulture Department Expenditure and Revenue, by Chapter, 1988 – 2002 (in dirhams)

| Year | Salaries | Current Expenditure | Capital Expenditure | Total Expenditure | Total Revenue |
|---|---|---|---|---|---|
| 1988 | 18,727,377 | 3,541,321 | 2,571,463 | 24,840,161 | 626,025 |
| 1989 | 16,735,668 | 4,348,955 | 720,821 | 21,805,444 | 1,693,768 |
| 1990 | 18,133,049 | 4,724,004 | 2,244,707 | 25,101,760 | 3,002,278 |
| 1991 | 20,846,831 | 5,653,449 | 962,271 | 27,462,551 | 2,857,719 |
| 1992 | 22,565,212 | 5,832,809 | 4,041,253 | 32,439,274 | 3,880,599 |
| 1993 | 26,104,564 | 6,832,703 | 444,299 | 33,381,566 | 6,046,943 |
| 1994 | 29,560,982 | 5,794,968 | 1,727,962 | 37,083,912 | 9,557,057 |
| 1995 | 32,014,666 | 8,261,793 | 3,207,812 | 43,484,271 | 11,542,943 |
| 1996 | 33,072,965 | 11,512,248 | 13,805,829 | 58,391,042 | 12,055,007 |
| 1997 | 35,480,985 | 10,550,571 | 5,557,261 | 51,588,817 | 11,372,694.72 |
| 1998 | 39,391,327.77 | 12,604,718.69 | 5,788,651.04 | 57,784,697.50 | 14,068,343.94 |
| 1999 | 39,488,261.68 | 11,635,163.10 | 3,146,767.52 | 54,270,192.30 | 14,068,076.49 |
| 2000 | 42,368,105.80 | 19,643,251.45 | 3,613,553.76 | 65,624,911.01 | 18,825,454.80 |
| 2001 | 47,005,678.00 | 18,453,724.94 | 9,010,108.22 | 74,469,511.38 | 20,046,486.03 |
| 2002 | 47,957,992.00 | 19,740,548.37 | 4,635,202.71 | 72,333,744.06 | 19,613,980.26 |
| Total | 469,453,665.45 | 149,130,227.55 | 61,477,961.25 | 680,061,854.25 | 149,257,375.24 |

## Public Parks and Horticulture Department Expenditure and Revenue,1988 – 2002



## Vehicles and Machinery

The increasing workload of the Department was matched by an increase in the number of its vehicles and other machinery. These are used to transport Agronomists and Supervisors to and from locations as well as to transport labourers, agricultural tools, fertilisers, seedlings, agricultural soil and agricultural waste, as well as for other purposes. The following table, on page 560, illustrates the increase in number of vehicles and machinery used by the Department.

## Revenue and Expenditure

The expenditure of the Public Parks and Horticulture Department includes the cost of manpower, including salaries, allowances, housing benefit and transportation. This amounts to around 75-80% of the total expenditure. The reduction in manpower after the introduction of modern horticultural techniques led to a significant reduction in the Department's total expenditure as illustrated in the table below, on page 561.

Sources of revenue derive from the implementation of a number of Municipal Ordinances covering, for example, payment of the value of damage resulting from traffic accidents, damage resulting from companies working in cultivated areas, revenue from sale of seedlings, revenue from sale of Rodus fodder and other revenues collected from companies violating Municipal Ordinances.

Total revenues are low in comparison to expenditure, but this is compensated for by the benefits to the community of the landscaping work carried out in the city and in public parks, the cultivation of roadsides and central reservations, the cultivation of forests and nature reserves. Some of the Horticulture Section's revenue from sale of seedlings and fodder from the Rodus farm was transferred to the Horticulture Services Section after this was established in 1997.

| Number | Name of Park | Year of Inauguration | Year of Re-development | Total Area (in sq.m.) |
|---|---|---|---|---|
| 1 | Mushrif | 1974 | 1989 | 1,250,000 |
| 2 | Al-Safa | 1975 | 1992 | 640,000 |
| 3 | Jumeirah Beach | 1989 | - | 131,370 |
| 4 | Al-Mamzar | 1994 | - | 990,000 |
| 5 | Al-Khor | 1994 | - | 960,000 |

## Main Residential Parks and Squares in residential areas of Dubai, 1982 – 2002, showing year completed

| No. | Name of Park | Year | No. | Name of Park | Year | No. | Name of Park | Year |
|---|---|---|---|---|---|---|---|---|
| 1 | Ittihad | 1982 | 8 | Hamriyyah | 1988 | 15 | Al-Tawar | 1997 |
| 2 | Sheraton | 1983 | 9 | Al-Rashidiya | 1988 | 16 | Oud Meitha | 1998 |
| 3 | Burger King | 1983 | 10 | The Memorial | 1988 | 17 | Hor Al-Anz | 1998 |
| 4 | Nayif | 1985 | 11 | Khazan | 1989 | 18 | Karamah | 1999 |
| 5 | Al-Jamal | 1986 | 12 | Burj Nahar | 1993 | 19 | Shu'la | 2000 |
| 6 | Al-Wasl | 1987 | 13 | Open Beach | 1994 | 20 | Nad Shema | 2001 |
| 7 | Airport | 1987 | 14 | Umm Suqeim | 1996 | | | |

## 21 public squares were developed during 1987 and 2002, as illustrated in the following table:

| No. | Name of Square | No. | Name of Square | No. | Name of Square |
|---|---|---|---|---|---|
| 1 | Khawaneej | 8 | Hamriyyah (1) | 15 | Al-Quoz (1) |
| 2 | Mehaisina | 9 | Hamriyyah (2) | 16 | Al-Quoz (2) |
| 3 | Rashidiya (1) | 10 | Umm Suqeim (1) | 17 | Jumeirah (1) |
| 4 | Rashidiya (2) | 11 | Umm Suqeim (2) | 18 | Jumeirah (2) |
| 5 | Rashidiya (3) | 12 | Bed'a | 19 | Jumeirah (3) |
| 6 | Al-Tawar | 13 | Jafliah | 20 | Hadhbiyah |
| 7 | Muraggabat | 14 | Al-Mankhool | 21 | Al-Safa |

## Development of Public Parks in Dubai

Over the past twenty years, there has been a lot of progress made in terms of public parks in Dubai. Prior to 1980, there were only two parks, Mushrif and Al-Safa, opened in 1974 and 1975 respectively. Since 1982, however, there has been considerable effort expended on identifying suitable locations for new parks, and then on establishing them, including some in the city centre, and squares.

Between 1982 and 2002, twenty new parks have been established as well as 21 new squares. Other work included a complete re-design of Al-Safa Park, with the construction of a hill and

new lakes.

The following table summarises details of the most important and largest public parks in the Emirate of Dubai.

There are still areas on the structural plan for the Emirate of Dubai that are allocated for parks and landscaping. By 2005 the number of parks is expected to increase from 21 to 29, with a further 21 squares. These have all contributed to the earning of a new title for Dubai of City of Parks, to add to those which it has already earned, such as Pearl the Gulf, Most Beautiful Arab City and City of Investment and Tourism.

The parks have a wide variety of attractions for the public. Excellently-located, some adjoining the Arabian Gulf or the Creek, they each have different designs, derived from their architectural, landscaping or natural features.

The plants are kept well-maintained, through a programme designed so that it is carried out when the parks are not open to the public, while the parks themselves and their facilities are regularly cleaned.

Another attraction is the wide diversity of planting, including trees, ornamental trees, fruit trees, shrubs, ground cover plants, ornamental bulbs, succulents, thorny plants, perennial and annual flowers. Good use has been made of the 900 local plant species found within the Municipality Nurseries.

The Khor Dubai Park (Creek Park) has a particularly innovative planting programme, with a total of 238 individual species, some of which have been introduced to the Arabian Gulf for the first time, like Royal Palm, African Oil Palm, Pento Palm and Sykes' Palm, in addition to many decorative trees such as *Spathodea, Araucaria, Adansonia, Chorisia* and many other plants. Particularly notable are the succulents and spine-bearing plants found in the rock garden.

Watering is done through automated systems, which also distribute fertilisers, a feature unique to Dubai.

The facilities available for visitors are also very varied, including children's play areas, lakes, beaches, swimming pools, barbeque areas, sports training areas (Al-Safa Park), sports fields (football, volleyball, basketball, tennis, 18-hole golf), electronic games halls, theatres, train tours within the parks, bikes for touring the parks, directional signs, internal radio broadcasts, toilets

**Some of the permanent attractions in the various parks are detailed in this table.**

| Item | Name of Park | Permanent Activities |
|---|---|---|
| 1 | Al-Mushrif | Swimming pools (one for men, another for women and children), Global Village, recreational games, riding horses and camels, circular train, barbeque areas, date-palm plantation, flower garden, mosque, park nursery, lavatories for men and women, drinking water coolers, restaurants, cafeterias and canteens, seating areas, night-time lighting, facilities for the disabled, car parks inside and outside the park, direction signs and tennis court. |

| | | |
|---|---|---|
| 2 | Al-Mamzar | Five beaches for swimming and walking, equipped with five lifeguard towers, changing rooms, umbrellas, swimming pools, including one large pool and three smaller pools, 15 chalets (10 large and 5 small), Park Tower, play area, cafeteria, canteens, traditional cafe', barbeque areas, circular train, lavatories for men and women, skating area, drinking water coolers, night-time lighting, directional signs, seating areas, facilities for the disabled, car parks inside and outside the park and bicycles. |
| 3 | Khor Dubai Park<br>(Creek Park) | Theatre, cable cars, park train, bicycles, barbeque areas, lavatories for men and women, drinking water coolers, boats for sailing in Dubai Creek, hot air balloon, restaurants and canteens, Al-Aflaj Heritage Village, golf course and clubhouse, beach theatre, facilities for the disabled, night-time lighting, seating areas, car parks inside and outside the park, directional signs, Snow World and Children's City. |
| 4 | Al-Safa | A Sports Playground which includes a football pitch, volleyball, basketball, tennis courts, an area for track and field events, a waterfall and lakes area, fixed play equipment area, electronic games area, Traffic Village, circular train, iron train, bicycles for hire, restaurants and canteens, lavatories for men and women, facilities for the disabled, Park Nursery, seating areas, night-time lighting, car parks outside the park, directional signs, jogging & walking track outside the park fence, seating outside the park fence and a special ladies park.a |
| 5 | Jumeirah Beach | A swimming beach equipped with safety features and lifeguard towers, changing rooms, a theatre, fixed play equipment area, volleyball courts, restaurants and canteens, lavatories for men and women, drinking water coolers, facilities for the disabled, night-time lighting, seating areas, car parks inside and outside the park and directional signs. |

and chalets that can be rented for use during daylight hours.

The needs of the disabled are also catered for, with special car-parks, access ramps, lavatories and recreational facilities.

The parks have been designed in such a way that not only can they be updated but also they have special areas that can be used for events staged as part of the Dubai Shopping Festival, like Snow City and the Spaceship. Such events are planned by a special office that has been given the responsibility for devising and organising them.

Events held in the parks during the 2000 and 2001 Shopping Festivals contributed in an important way to the success of the festivals while the Department was recognised for its achievements by winning the Excellence Award for three consecutive years between 2000 and 2002.

All of the parks have restaurants and cafeterias with mosques and praying areas in most, especially the public parks.

## Recreational equipment available in the parks

One of the most important aspects when play equipment is chosen for the parks is that related to the health and safety of visitors, especially children. The equipment is also selected so as to provide a range of options for all age groups and family members.

Inside the Zoo

A Socotra Cormorant in the Zoo

## The Zoo Section

Dubai Zoo has two units, the Animal Care Unit and the Administrative Services Unit. It is responsible for looking after the animals and for operating zoo facilities.

The origins of Dubai Zoo date back to 1967, when an Austrian expatriate, Otto J. Bulart, obtained permission from the late Ruler of Dubai, HH Sheikh Rashid bin Saeed Al Maktoum, to construct a special enclosure for the keeping of wild animals on a 2-hectare plot in Jumeirah. At the time, the area was still largely desert, with a few date palms and naturally-occurring trees, and only a few European expatriates then lived in the vicinity.

The first animals in the Zoo included some big cats and monkeys as well as a few ungulates (animals with hooves) and a small aquarium. Bulart and his son, along with a few friends, allowed visitors to come and see the collection, and continued to run the fledgling Zoo until 1971, when it was taken over by the Municipality.

Although the district of Jumeirah began to develop, the Municipality was able to enlarge and to re-design the Zoo between 1984 and 1989. From that time until 2002, although some further work was carried out, it was limited in scope because of plans for a new Zoo to be built in the Al Mushrif area. It is due to be built during the 2006-2010 Municipality Five Year Plan.

Siberian Leopard

The Zoo is one of the oldest in the whole of the Arabian Peninsula and was the first in the Arab world to successfully breed chimpanzees and Arabian wildcats. It is also among the few zoos in the world to have bred in captivity Socotra Cormorants, a near-endemic for the Emirates, the Yellow-legged Gull, the Great Black-headed Gull and the African Spoonbill.

The Zoo is now a Section within the Public Parks and Horticulture Department and is run by a specialist team headed by a leading zoologist, who has been able to establish a very diverse collection, despite the limitations imposed by the Zoo's size.

Covering an area of 1.76 hectares, the Zoo in 2001 had a collection of 157 species, with a total of 1001 animals, including 228 mammals, 415 birds, 338 reptiles and 20 aquatic species. At† present the zoo houses 141 species of vertebrates that included 48 species of mammals with 163 specimens, 65 species of birds with 416 specimens and 28 species of reptiles with 192 specimens.

The Zoo has an important collection of species from the Arabian region, including Arabian Gazelle, Sand Cat, Arabian Wildcat, Arabian and Rueppell's Fox, Arabian Wolf, Striped Hyaena, Greater and Lesser Flamingo, Black-headed, Sooty and Yellow-legged Gulls, Tawny and Bonelli's Eagles, Sand Boa, Hissing Sand Snake, Saw-scaled and Sand Vipers, Desert Monitor and Oscillated Skink.

Other animals, from other parts of the world, include Bengal Tiger, Siberian Tiger, Somali Leopard, Eastern Lowland Gorilla, Chimpanzee, Rhesus, Bonnet, Green and Dent's

Monkeys, Reticulated Giraffe, Indian and Reticulated Pythons, Australian Carpet Python, Ball Python, Common Iguana, African Spur-thighed, Greek, Leopard and Indian Star Tortoises and American Red-eared Terrapin.

In 1997, a special gorilla house, appropriately air-conditioned, was built to resemble their natural habitat, with tree trunks, branches and hanging ropes. A grassed enclosure was added in 2001, when air-conditioned units for housing snakes were also built.

The Zoo has its own small lecture theatre, capable of seating 50 people, and a small library, where lectures are given to visiting students and other visitors.

The Zoo has been able to develop close co-operation with a number of other Zoos, with whom it has exchanged animals, including those in Al Ain, Riyadh, Kuwait, Qatar, Damascus, Mashad in Iran, Dhaka Zoo in Bangladesh, Colombo Zoo in Sri Lanka and others in Singapore, Stuttgart in Germany and Amsterdam in Holland and has won recognition as an important centre of scientific research.

In 1993, it became the first Zoo in the Middle East to be a member of the World Association of Zoos and Aquariums, WAZA.

It also acts as a refuge and shelter for animals confiscated from people violating laws and local ordinances or which are confiscated when passing through the UAE in transit. These latter are kept at the zoo until the status is resolved.

The Zoo also frequently receives animals formerly kept as household pets when their owners are no longer able or willing to take care of them.